Medicaid DRG Hospital Reimbursement Systems: A Technical Guide for State Implementation

Health Policy Studies

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MEDICAID DRG HOSPITAL REIMBURSEMENT SYSTEMS:

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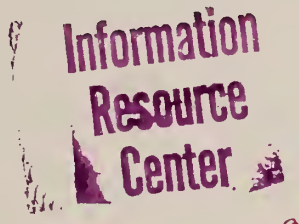

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June 1985

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If, in spite of the best efforts of the above persons, errors or omissions exist in this report, the authors alone are responsible.

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Introduction and Purpose of this Document

In 1983, Medicare experienced its most significant change made since the program began twenty years ago. In an effort to better control cost and give hospitals incentives to operate more efficiently, Congress changed the way Medicare paid for inpatient hospital care. The program shifted from a retrospective, cost-based reimbursement system for inpatient hospital care to one that determines in advance the amount that will be paid for such care. This new Medicare prospective payment system (PPS) establishes a specific price per admission for each type of case a hospital is likely to treat. The scheme used by Medicare to classify cases is based upon the expected level of hospital resources required to treat each case and is called the diagnosis-related group (DRG) system.

Since Medicare adopted its new payment system, other third party payers have looked with increased interest at reimbursement systems that pay a predetermined fixed fee for each admission based on the case diagnosis. This approach may be particularly attractive to state Medicaid programs seeking new ways to control program costs. Seven states -- Michigan, Minnesota, Ohio, Oregon, Pennsylvania, Utah, and Washington -- have recently implemented or will soon implement Medicaid DRG-based hospital payment systems similar to Medicare's, and several other states are considering this option.

The development of a DRG-based hospital reimbursement system for a state Medicaid program will represent, for most states, a technically challenging undertaking that requires a seemingly limitless number of policy and procedural issues to be addressed. The purpose of this document is to provide state officials with the information needed to meet this challenge and develop a reimbursement system that is appropriate for their state.

This report is organized to allow these different audiences easy access to the information of greatest relevance to them. A glossary defines many of the technical terms used in this document. Each chapter focuses on a specific set of questions concerning the development of a Medicaid DRG reimbursement system. In general, the earlier chapters address broader questions that may be asked by individuals not completely familiar with hospital reimbursement issues. For example, Chapter 1 identifies the pressures that are forcing states to review their Medicaid hospital reimbursement systems. This chapter outlines the questions a state should raise when considering a switch to a DRG-based system. These questions concern the type of hospital reimbursement system the state's Medicaid program currently operates, the incentives offered to hospitals under this system, and its relative effectiveness in controlling inpatient hospital expenditures.

In Chapter 2, the basic elements of a DRG-based system are described for the reader unfamiliar with this approach. These components include: the classification of cases into DRG categories; the calculation of measures of the relative resource requirements for each DRG (relative weights); and, the computation of the price to be paid for each case within a DRG. A simple example is used to illustrate the way in which rates are actually developed under such a system.

Subsequent chapters move into more detailed technical discussions of DRG system design and implementation. Chapter 3 is intended primarily for Medicaid directors and program policy staff. It identifies the policy areas in which states developing a DRG system must make key policy decisions. These include: methods of calculating DRG relative weights; computation of DRG prices; exclusion of different types of facilities; treatment of special costs, such as capital and medical education; hospital peer groups; and payment for atypical cases. The issues surrounding these decisions are discussed and the options selected by states that have implemented or will soon implement Medicaid DRG reimbursement systems are described.

Chapters 4, 5, and 6 concentrate on the actual process of developing and implementing a DRG system. These chapters are most appropriate for Medicaid program staff who are responsible for this effort. Chapter 4 provides an overview of the development process and identifies the needed management and

resource commitments. Chapter 5 focuses on the extensive data base development and analysis effort required to create Medicaid DRG prices for specific states. Chapter 6 discusses the modifications that must be made in related areas -- claims processing, provider relations, and utilization review -- to support the DRG system. Finally, Chapter 7 speculates on future development DRG-based reimbursement systems. This includes the potential use of the DRG classification scheme to competitively contract with hospitals for Medicaid coverage of certain DRGs.

Chapter One

Medicaid DRG Reimbursement: Why Switch?

A. Introduction

The first, and perhaps most important questions state officials might ask when considering the adoption of a Medicaid DRG-based hospital reimbursement system are: "Why should we move away from our current reimbursement system?" and "What are the advantages and disadvantages of switching to a DRG-based approach?"

The first of these questions can be addressed by examining national trends in Medicaid hospital expenditures and federal requirements for state Medicaid reimbursement policies. Both questions will be addressed by identifying issues that state officials should examine.

B. Medicaid Hospital Payments: A Brief Historical Perspective

A brief review of Medicaid expenditure and policy trends can help explain why a significant number of states have changed their Medicaid hospital reimbursement policies.

The principal objective of the Medicaid program when it was established in 1965 was to increase the poor's access to health care. Data show a substantial increase in health care utilization rates for this population, indicating that the program has achieved this objective. This success, however, has had its costs. During the 1970s, state Medicaid program expenditures

increased dramatically, growing more than 15 percent per year. As a result, Medicaid -- which is projected to cost over $40 billion in federal and state funds in 1986 -- has become the largest and fastest growing budget item in many states.

The purchase of inpatient hospital care for Medicaid recipients is a substantial contributor to both the size of the national Medicaid budget and its significant growth over time. Nationwide, payment for inpatient hospital care accounts for about 27 percent of total Medicaid vendor payments, second in size only to nursing home expenditures. On a state level, the portion of total Medicaid payments going to inpatient care in general hospitals varies widely, ranging in fiscal 1983 from a low of 13 percent in New Hampshire to a high of 39 percent in California. (In general, states with larger proportionate expenditures on hospital services have smaller proportionate expenditures on nursing home services.) Overall Medicaid costs more than doubled between 1977 and 1984, increasing from $16.2 billion to $32.2 billion -- a compounded annual rate of growth of 11.25 percent (see Table 1.1). During the same period, inpatient hospital payments grew almost as rapidly, increasing at an annual rate of 11.1 percent. Looking at only the most recent period of 1982 to 1984, nationwide Medicaid hospital payments rose substantially faster (14.8 percent) than total program costs (10.0 percent).

Table 1.1
Nationwide Medicaid Total Payments and Inpatient Hospital Payments
1977 - 1983

	Total Payments		Inpatient Hospital Payments	
Year	($000s)	% Change	($000s)	% Change
1977	16,239	—	4,562	—
1978	17,992	10.8	4,992	9.4
1979	20,472	13.8	5,655	13.3
1980	23,311	13.9	6,412	13.4
1981	27,204	16.7	7,194	12.2
1982	29,399	8.1	7,640	6.6
1983	32,351	10.0	8,802	14.8
1984*	34,244	5.9	9,476	7.7
Change, 1977 - 84		111%		108%
Annual % Change, 1977 - 84		11.25%		11.1%
Annual % Change, 1982 - 84		7.93%		11.37%

* Preliminary Estimates

Source: Health Care Financing Administration

The way in which state Medicaid programs have historically paid for inpatient hospital care has contributed to the growth of hospital costs. Until 1981, unless a state received special federal waivers, it was required to pay hospitals for the full costs, using the same criteria found in the federal Medicare program. Under this approach, hospitals were essentially reimbursed for whatever costs they incurred. This cost-based method was attractive to hospitals and it did improve access to hospital care for both Medicaid and Medicare beneficiaries. At the same time, it did not provide incentives to encourage hospitals to provide care in the most efficient manner. The option of developing a reimbursement system that contained costs was effectively closed to many states during the 1970s, so a number of states moved to limit Medicaid hospital expenditures through other means, such as establishing prior authorization requirements or limiting the number of hospital days that Medicaid would cover.

The fiscal pressures caused by the recession in the early 1980s resulted in a series of events that lifted this restriction on state Medicaid hospital reimbursement policies. During this period, the federal government moved to both reduce the amount of funds it provided to states to finance their Medicaid programs and to provide states greater flexibility to operate these programs efficiently. The 1981 Omnibus Budget Reconciliation Act (P.L. 97-35) removed the requirement that state Medicaid programs

use Medicare cost-based reimbursement principles to pay for hospital care. Instead, states were allowed to establish their own reimbursement systems, provided that the rates they paid were sufficient to cover the costs incurred by "an efficient and economically operated facility" and that consideration be given to hospitals serving a "disproportionate" share of poor patients. This change in federal statute occurred at the time that a growing number of states were attempting to break away from the Medicare approach and develop alternative prospectively determined reimbursement systems.

A second major change in the way government programs paid for hospital care occurred in 1983 when the Medicare program abandoned its cost-based reimbursement system and moved toward an approach that classifies admissions into various categories called diagnosis-related groups (DRGs) and establishes specific per admission payment rates for each DRG category.

C. DRG-Based Systems in Perspective: A Classification Scheme

This combination of rising Medicaid costs, the relaxation of federal requirements for Medicaid hospital reimbursement, and the change in Medicare's reimbursement methodology, has resulted in many changes in state Medicaid hospital reimbursement practices in recent years. While the reimbursement systems adopted by the various states vary widely they may generally be divided into two classifications: retrospective and prospective systems.

According to Korda and Koetting [1], retrospective systems base hospital payment on costs incurred and include some form of final settlement that reconciles payment to costs. In contrast, prospective payment programs establish reimbursement in advance of the period to which it is applied and do not involve any final reconciliation of payments to costs.

Within each of these groups, further classifications can be made. Retrospective systems, while based upon costs, may in fact, limit payment at some maximum determined by inflation-based trend factors or some peer group parameters. The rates established under a prospective system may derive from a trending forward of base year costs for individual facilities or peer groups, or may be set equal to some flat rate or negotiated amount.

Table 1.2 identifies the Medical hospital reimbursement methods used in individual states as of November 1984. This table illustrates the fact that thirty-three states employed prospective payment systems within their Medicaid programs at that time. In contrast, in April 1982, only fourteen states utilized such systems. In addition to these classifications, it should also be noted that states theoretically have the option of establishing not just a Medicaid-only reimbursement system, but an all-payer rate-setting program that would set hospital rates

Table 1.2

Medicaid Inpatient Hospital Reimbursement Method, by State

State	Reconciled			Non-Reconciled			
	Cost	Cost to Trend Limit	Cost to Peer and Trend Limit	Base Trended	Trended Base With Peer	Flat Rate by Group	Negotiated
Alabama				X			
Alaska							X
Arkansas					X		
California*			X				X
Colorado				X			
Connecticut			X				
Delaware	X						
Washington, DC							X
Florida				X			
Georgia				X			
Hawaii	X						
Idaho				X			
Illinois					X		
Indiana	X						
Iowa				X			
Kansas				X			
Kentucky					X		
Louisiana		X					
Maine				X			
Maryland				X			
Massachusetts				X			
Michigan			X				
Minnesota				X			
Mississippi					X		
Missouri		X					
Montana	X						
Nebraska				X			
Nevada						X	
New Hampshire	X						
New Jersey						X	
New Mexico		X					
New York					X		
North Carolina				X			
North Dakota	X						
Ohio						X	
Oklahoma				X			
Oregon				X			
Pennsylvania						X	
Rhode Island							X
South Carolina	X						
South Dakota	X						
Tennessee				X			
Texas	X						
Utah						X	
Vermont							X
Virginia					X		
Washington						X	
West Virginia	X						
Wisconsin		X					
Wyoming	X						

*Two systems in effect.

Source: Updated from Korda and Koetting (1984).

for all hospital payers within the state. Maryland, Massachusetts, New Jersey, and New York have had the necessary federal waivers to include the federal Medicare program in such programs. However, Massachusetts and New York will drop Medicare participation rather than attempt to meet stringent new federal regulations. Because an adequate discussion of the issues associated with the establishment of an all-payer versus Medicaid-specific reimbursement system are beyond the scope of this document, this report will focus exclusively on the issues and options associated with the development of Medicaid-only DRG reimbursement systems. (For a discussion of another Medicaid option pioneered in California, see the NGA publication entitled "Selective Contracting for Health Services: Policy Implications and Considerations for States.")

D. Why Switch to a DRG-based System?

DRG-based hospital reimbursement systems represent a form of prospective payment that pays hospitals a predetermined amount per discharge. Under this approach, cases determined to require similar amounts of hospital resources are grouped together and paid equal amounts.

These DRG systems represent only one of a range of alternative reimbursement options open to state Medicaid programs. State officials considering the move to a Medicaid DRG-based hospital reimbursement system should first consider

whether the state's current hospital reimbursement system is doing an adequate job of controlling costs while maintaining access to needed care. A series of questions should be asked to assess that system's performance. These questions might include:

- What has been the rate of growth in state Medicaid hospital expenditures over time with this system? What factors have accounted for these changes -- e.g., changes in the number of eligible patients, utilization rates, lengths of stays, or unit costs?
- How do these changes compare to those of other state Medicaid programs; with hospital input price levels; and other insurers in the state?
- What methods has the state used to control inpatient hospital expenditures -- e.g., limitations on covered days, recipient cost-sharing, etc? Have these measures spread the burden equitably across providers and recipients? Have these measures been effective in providing incentives for hospitals to behave more efficiently?
- To what extent are the incentives in the state's current Medicaid system consistent with those within other major payers' approaches, such as Medicare's? To what extent does the state's current Medicaid system require hospitals to maintain different accounting and reporting mechanisms?

If the answers to these questions cause state officials to consider other Medicaid hospital reimbursement options, another question arises: If the state changes its inpatient hospital reimbursement approach, should it consider a DRG-based system?

A DRG-based reimbursement system is not a panacea for all the problems of the health care system. It represents but one approach to hospital payment. A Medicaid-only DRG-based prospective payment system does possess the following attractive features:

- it gives states more control over Medicaid hospital expenditures than many other approaches;
- it provides hospitals with greater incentives to foster the efficient provision of care by hospitals than systems that reimburse hospitals for smaller units of care, e.g., individual services, patient days, etc;
- it extends the same set of incentives offered to hospitals by Medicare, a much larger payer of hospital care, and thus helps to avoid extra staff and paper work for hospitals;
- it can fairly allocate limited program funds among hospitals by paying similar hospitals the same amount for the same type of case; and

- it provides a standardized definition of a set of products in the health care system -- i.e., a hospital discharge -- and allows the development of a standardized data base for policy-making purposes.

The importance of this last point should not be underestimated. The DRG system represents a major step forward in the ability to define the products of the health care system. Health care policy makers and payers can be more specific about the products they are purchasing -- distinguishing, for example, between the cost for a tonsillectomy and a routine delivery. Many states believe that the introduction of the classification system for Medicaid will provide them with a better system of measurement that can eventually lead to selective contracting with hospitals for certain high-volume DRGs.

However, there are negative aspects of a DRG-based system -- many of which are also associated with other payment approaches -- that should be noted:

- the system provides hospitals with an incentive to increase admissions, therefore states will need to have a strong program to review admissions data;
- it provides hospitals with the incentive to discharge patients as early as possible, therefore requiring close monitoring of discharge patterns for problems affecting patient welfare; and

- compared to some other payment approaches -- particularly cost-based systems -- and depending on the level at which rates are set, it could affect the financial stability of certain facilities, such as large urban hospitals with heavy Medicaid patient loads or sole-provider rural hospitals.

In a given state, it might not have the potential to reduce costs as greatly as an alternative approach (e.g., California's selective contracting initiative). Taken as a whole, a DRG-based hospital reimbursement system has qualities that might recommend it to state officials who are examining hospital reimbursement options for their state Medicaid programs. The next chapter provides a general description of the actual mechanics of establishing rates under a DRG-based methodology.

FOOTNOTES

1. Holly Korda and Michael Koetting, State Medicaid Inpatient Hospital Reimbursement: Summary of State Programs, a report prepared for the Health Care Financing Administration by Abt Associates, Inc., Cambridge, Massachusetts, December 1984. The reader is referred to this document for descriptions of individual state reimbursement methodologies.

Chapter Two

DRG Payment Systems - How Do They Work?

A. Introduction

This chapter identifies and describes the basic elements of a DRG reimbursement system, and illustrates how DRG rates are developed through the use of a hypothetical example. The discussion of a basic DRG model is supplemented by later chapters that focus on more specific system design options, and the actual mechanics of developing DRG rates and implementing a system.

B. Basic Components of a DRG Reimbursement System

A DRG-based payment system provides incentives for hospitals to control the costs of treating an inpatient case. This is accomplished by paying a predetermined price for each treated case. The three basic elements of a DRG-based payment system are:

- classifying cases into DRGs;
- estimating the resources involved in caring for each of these different admission categories; and
- calculating the price to be paid for each category.

The following sections review each of these three steps in more detail.

1. Classification of Cases into DRGs

The case classification system groups together cases that require similar amounts of hospital resources. While several different classification systems have been developed (see Appendix A), the most commonly accepted and utilized approach is the diagnosis-related group or (DRG) system. This classification method, originally developed by researchers at Yale University for utilization review and internal audit purposes, assigns cases to one of 468 different groups. It has also been applied by the Medicare program and several state Medicaid programs for their hospital payment systems.

DRGs were not created only from statistical analysis. A great deal of medical judgment was also used to determine the distinctions that make medical sense. These combinations were verified statistically, and physicians used statistics to augment their medical judgment. This combination of medical judgment and empirical work is unique to the DRG system, and is one reason it is so widely accepted.

A form of "decision tree" logic is used to assign cases to specific DRGs. That is, a series of questions are asked about a particular patient, and the sequence of answers determines the DRG to which that case is assigned. The questions focus on the aspects of a patient's condition that research found to be related to the amount of hospital resources required to care for the patient. These include:

- major body system affected;
- whether or not surgery was performed;
- principal diagnosis;
- age of patient;
- any secondary conditions; and
- discharge status.

Once a patient is discharged from a hospital, the case can be assigned to a DRG. A computer program known as "grouper" assigns cases to individual DRGs using standard information called the uniform hospital discharge data set (UHDDS). This can be found on most hospital billing forms (see Table 2.1). The first thing the DRG grouper program needs to know is the general nature of the problem. That is, was this patient admitted to treat a circulatory system problem, a respiratory system problem, a pregnancy, or a mental disease? There are twenty-three general problem types, called major diagnostic categories (MDCs). The MDCs generally match the medical specialties of physicians (see Table 2.2). This makes the DRGs more useful as a management tool for hospitals, and helps the state's utilization review program analyze individual physician practice patterns. Physicians are, after all, responsible for resource-use decisions in hospitals.

Table 2.1

Uniform Hospital Discharge Data Set Elements

DATA ELEMENT	DEFINITION
Personal Identification	A unique number assigned to each patient usually at the time of admission to the hospital.
Date of Birth	Month, Day, and Year
Sex	Male or Female
Race and Ethnicity	American Indian or Alaskan Native; Asian or Pacific Islander; Black; Hispanic; White; and Other.
Residence	Zip Code
Hospital Identification	Month, Day, and Year
Physician Identification Attending	He/she is the physician primarily responsible for the patient's care from the beginning of the hospital episode.
Operating	He/she is the operating physician who performed the principal procedure.
Principal Diagnosis	The final diagnosis which best explains why the patient was admitted to the hospital.
Other Diagnosis (maximum of five diagnoses including the principal should be abstracted)	All diagnoses referring to conditions that are present upon admission, that develop during the given episode of care, or that impact the treatment received and/or the length of stay. Excluded are diagnoses that relate to a previous episode of care, which have no impact on the current hospitalization.
Procedures and Dates	Significant procedures carry an operative or anesthetic risk, require highly trained personnel or require special equipment.

Table 2.1 (Continued)

DATA ELEMENT	DEFINITION
Disposition and Dates	Discharged to home; left against medical advice; discharged to another short-term hospital; discharged to a long-term care institution and died.
Expected Principal Source of Payment	Self-pay; workmen's compensation, Medicare, Medicaid; maternal and child health; other government payments; Blue Cross, insurance companies; no charge; and other.

Source: Uniform Hospital Discharge Data Minimum Data Set, Report to the National Committee on Vital Statistics, 1980.

Table 2.2
Major Diagnostic Categories

01 Diseases and Disorders of the Nervous System

02 Diseases and Disorders of the Eye

03 Diseases and Disorders of the Ear, Nose, and Throat

04 Diseases and Disorders of the Respiratory System

05 Diseases and Disorders of the Circulatory System

06 Diseases and Disorders of the Digestive System

07 Diseases and Disorders of the Hepatobiliary System and Pancreas

08 Diseases and Disorders of the Musculoskeletal System and Connective Tissue

09 Diseases and Disorders of the Skin, Subcutaneous Tissue and Breast

10 Endocrine, Nutritional and Metabolic Diseases and Disorders

11 Diseases and Disorders of the Kidney and Urinary Tract

12 Diseases and Disorders of the Male Reproductive System

13 Diseases and Disorders of the Female Reproductive System

14 Pregnancy, Childbirth, and Puerperium

15 Newborns and Other Neonates with Conditions in the Perinatal Period

16 Diseases and Disorders of the Blood-Forming Organs and Immunological Disorders

17 Myeloproliferative Diseases and Disorders and Poorly Differentiated Neoplasms

18 Infectious and Parasitic Diseases (Systemic or Unspecified Sites)

19 Mental Diseases and Disorders

20 Substance Use and Substance-Induced Organic Mental Disorders

21 Injuries, Poisonings, and Toxic Effects of Drugs

22 Burns

23 Factors Influencing Health Status and Other Contacts with Health Services

To better understand how DRGs classify patients, consider a patient admitted for treatment of a respiratory system problem. This case would be classified as illustrated in Figure 2.3. First, this case will be assigned to "Diseases and Disorders of the Respiratory System," category MDC 04.

The Yale researchers found that, in general, the most important determinant of the resources required to treat a case is whether a major operating room procedure was performed. Therefore, the first thing the program will want to know is whether such a surgical procedure was done. Most major diagnostic categories are divided into medical and surgical parts in this way. (The full DRG decision tree for one MDC, prepared by Yale University, is presented in Figures 2.4 and 2.5. Table 2.3 is easier to follow because the questions are made explicit. The appropriate lines in Yale's chart have been darkened so readers can also track the DRG logic using this broader decision tree).

If a major operating room procedure was <u>not</u> done during this admission, the specific type of respiratory problem is most useful in distinguishing whether a case will require more or less intensive treatment. A typical lung cancer admission will cost more to treat than pneumonia. So the next thing that the grouper program asks for is the principal diagnosis for this case. The cancer case will fall under "Respiratory Neoplasms," DRG 82.

FIGURE 2.3
AN EXAMPLE OF DRG LOGIC (CASE DESCRIBED IN TEXT)

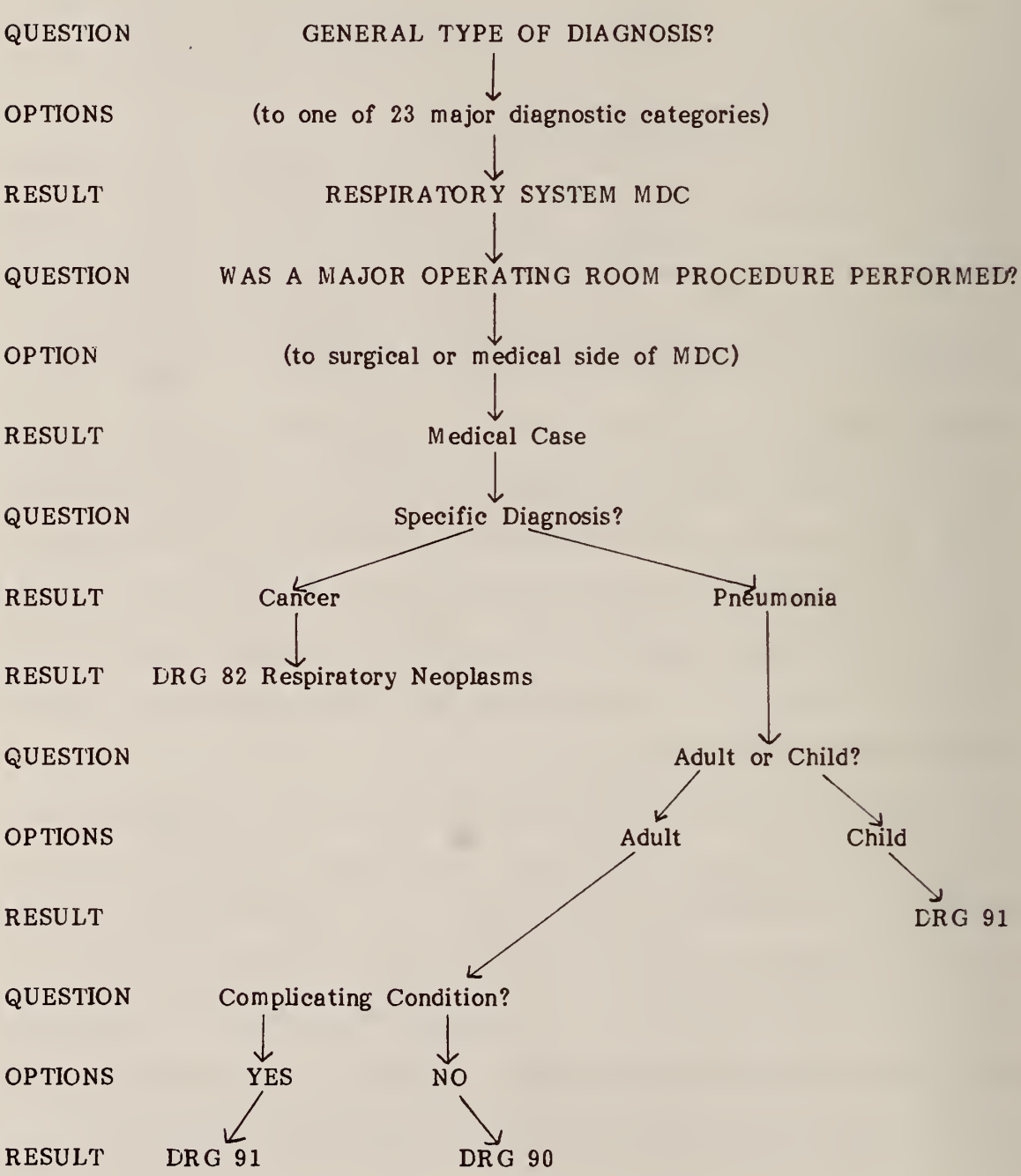
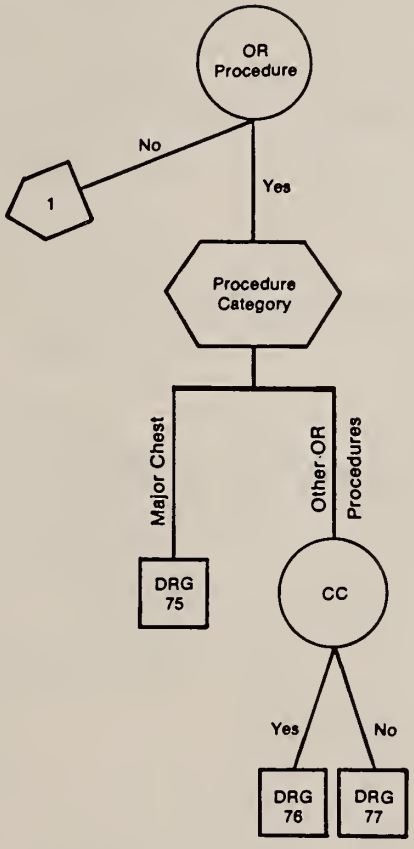


Figure 2.4

Major Diagnostic Category 04:
Diseases and Disorders of the Respiratory System

Surgical Partitioning

(See Figure 2.5)

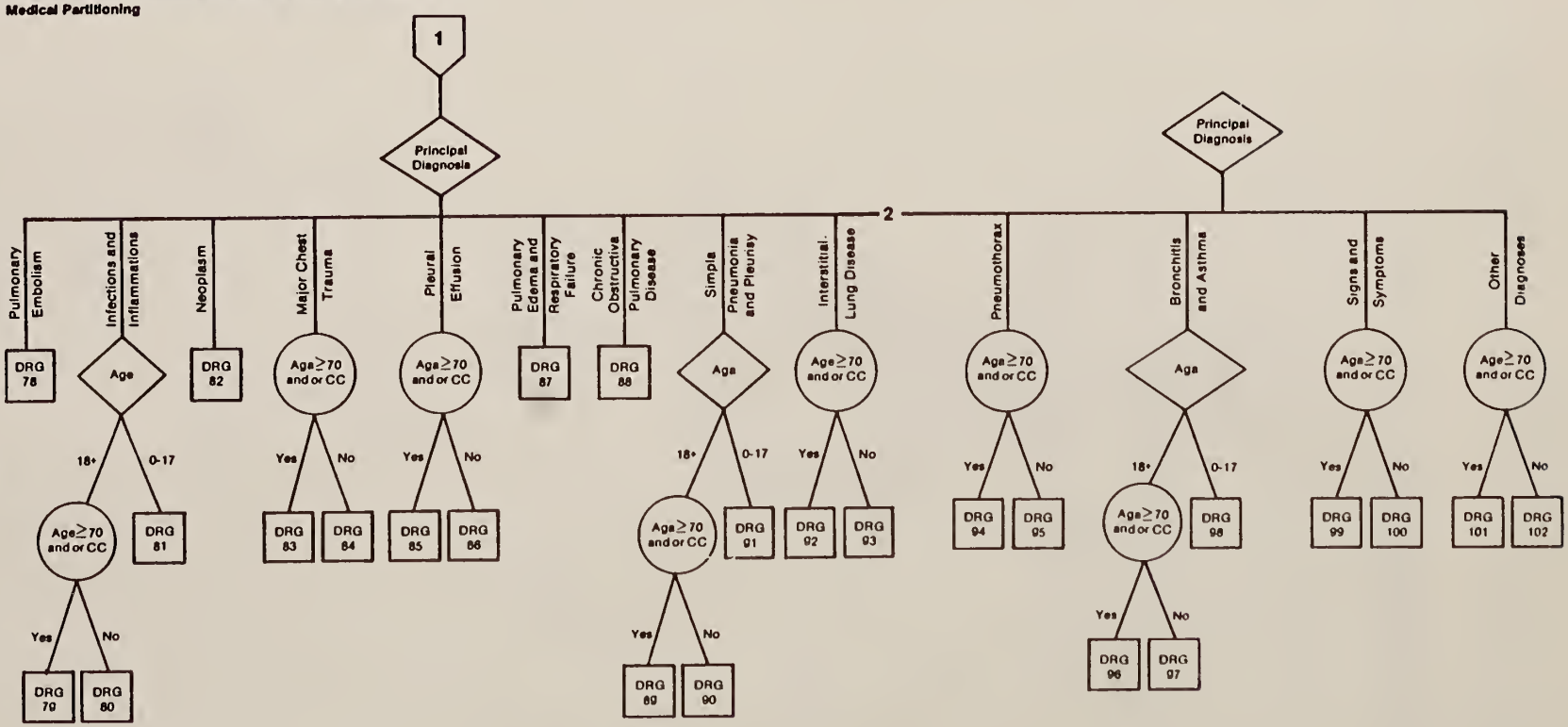


CC = Comorbidity and or Complication

Figure 2.5

Major Diagnostic Category 04:
Diseases and Disorders of the Respiratory System

Medical Partitioning



CC = Comorbidity and or Complication

If, instead, this admission was to treat simple pneumonia, the grouper would need more information. For pneumonia, children's cases require different resources than adult cases. So the grouper asks whether the person was less than eighteen years old. A child's admission would be classified as DRG 91. For adults, grouper needs still more information to categorize the case. The UHDDS data set allows multiple diagnoses for a single patient, such as lung cancer or pneumonia complicated by heart disease. For adults, such a complicating condition (also called a secondary diagnosis) may make that case more difficult and more expensive to treat. That is, the patient with certain secondary diagnosis listed on the billing form is probably more severely ill. Therefore, grouper asks whether the patient has any of a list of specific complicating conditions. If so, the case is classified as "Simple Pneumonia with Complicating Condition" DRG 89. Uncomplicated adult pneumonia cases are classified as DRG 90.

As this example shows, the steps in classifying a particular case can vary. However, the underlying logic is always the same. The first split is always the most important. Less important distinctions occur later in the decision tree. In our example, surgery was the first and most important variable. However, for a pregnancy, the most critical question is whether the admission actually resulted in a delivery. This separates admissions for false labor from the deliveries.

2. Relative Resource Weights

The second step in computing DRG prices is to determine how expensive each DRG is relative to the average Medicaid case. This step calculates numbers, called relative weights or values, that express the relationship of one DRG to another in terms of resource requirements, without actually using dollar values. This is useful since dollar values change over time, but the relative weights or values remain more constant. The data will be used in the future time -- the year the DRG program will go into effect (called the subject year). The year from which the data is drawn to construct the relative weights and prices is called the base year.

One way to calculate relative DRG weights would be to compute the average cost for the cases in each DRG and then divide this amount by the statewide average cost. The statewide average is the sum of the costs for all Medicaid admissions divided by the total number of admissions.

Table 2.6

DRG	No. of Cases	Average Cost	/	State Average	=	Relative Weight
1	2	$1,000	/	$2,000	=	0.5
2	1	$2,000	/	$2,000	=	1.0
3	1	$4,000	/	$2,000	=	2.0

If the state's average Medicaid cost is $2,000, the calculation for these hypothetical DRGs would be: [(2x$1000)+(1x$2000)+(1x$4000)]/4=$2000. As Table 2.6 indicates, the relative value for this example, DRG 3, is 2.0. This simply means that this DRG is, on average, twice as expensive to treat as the average case in the state. DRG 1 has a relative value of 0.5; meaning that this DRG is only half as expensive as the average Medicaid case.

Since the relative weights are not expressed in dollars, it is not necessary to worry about inflating these numbers in order to apply them to a future year. The relative weights only express relationships between DRGs and those relationships may be applied to any time interval or any subset of hospitals.

3. The Prices

The next step in the process is to determine the payment or price to be paid for each DRG. Suppose that a state knows that next year hospitals will treat 1,000 Medicaid beneficiaries. The state has also determined that $3,000,000 would have been the allowable treatment costs under cost-based reimbursement. This is an average of $3,000 per case ($3,000,000 / 1,000 = $3,000). In this example, $3,000 is the price per average case. This average price multiplied by the relative value for each DRG will yield the price to be paid for that DRG. The list of prices

for all DRGs is the DRG price schedule, i.e., prices determined in advance for treated cases. In the example using the three DRGs in Table 2.7, the price schedule would be:

Table 2.7

DRG	Relative Weight	x	Average Price	=	DRG Prices
1	0.5	x	$3,000	=	$1,500
2	1.0	x	$3,000	=	$3,000
3	2.0	x	$3,000	=	$6,000

As the example indicates, computing the price level requires an estimate of the number of treated cases the state will pay for during the subject year and an estimate of the amount of money the state needs to spend for Medicaid inpatient care. The number of cases can be projected by analyzing recent admissions trends or using the assumptions used to construct the Medicaid budget request or appropriation. These are obviously important numbers. If the state assumes that it will treat more patients, at a constant budget, the amount of money available for each case will decrease. Alternately, if the state assumes that admissions will fall, the amount available for each case would be larger. The correspondence between percent increases in cases (given a constant DRG budget) and percent decrease in monies available per case is inverse. That is, a 1 percent projected increase in cases will result in approximately 1 percent lower prices.

The second estimate needed to set the price level is the amount of money the state needs to spend on DRGs. This estimate has been derived in one of two ways:

- o budget neutral, in which the state will spend what it would have spent in the absence of DRGs, or
- o rate of increase, in which the state will spend a certain percent more (or less) next year than it would have spent under its previous reimbursement system.

A more detailed discussion of the issues associated with overall budget targets for a DRG-based system is presented in Chapter 3.

C. Modifications to the Basic DRG Model

The above sections describe a very basic DRG reimbursement model. At first review, the basic system may seem relatively simple. There are, however, certain limitations or problems with this basic DRG model that must be addressed if the prices established through this process are to accurately reflect differences in resource requirements in different types of cases. These limitations/problems include:

- • certain cases or conditions may not easily fit into any of the DRGs;
- • certain individual cases may require resources far below or far above the average for the DRG to which the case is assigned;

- certain costs may not be directly related to patient care and therefore are not easily included within the DRG model; and
- levels of care and, therefore, resource requirements may vary across different types of facilities.

States interested in establishing Medicaid DRG reimbursement systems may be required to develop additional policies designed to address these issues. Some of these issues are relatively minor and can be easily addressed; others are more complex and require careful consideration. The major policy areas and the alternatives open to states are described in the next chapter.

Chapter Three

Policy Issues in DRG Reimbursement Systems

A. Overview

State officials who are designing Medicaid DRG-based hospital reimbursement systems must be prepared to make a seemingly endless series of decisions. Some may address matters that relate to procedure more than policy. Others involve issues that will not even significantly affect the ultimate design of the system. There are, however, a number of very important policy decisions that significantly affect the design, scope, and eventual impact of the reimbursement system. This chapter will focus on this set of policy issues.

The objectives of this chapter are twofold: First, to discuss the goals or objectives of prospective payment systems, and, second, to describe selected policy issues in DRG system design. This discussion will:

- identify the major policy issues associated with the development of a Medicaid DRG-based hospital reimbursement system; and
- describe decisions made in each of these areas by states that have already designed or established DRG systems.

Table 3.1 lists these states along with their actual or planned implementation date. It also notes the type of payment system each DRG system replaced.

Table 3.1
STATE MEDICAID DRG REIMBURSEMENT SYSTEMS

	MICHIGAN	MINNESOTA	OHIO	OREGON	PENN.	UTAH	WASHINGTON
DRG IMPLEMENTATION OATE:	1-1-1985	implementetion scheduled for 8-1-1985	10-1-1984	implementetion echeduled for 10-1-1985	7-1-1984	7-1-1983	1-1-1985
PREVIOUS SYSTEM:	retrospective, cost beaed syetem	prospective, flet rete eystem	retrospective, cost beaed system	flet rete peyment system	retrospective	retrospective, cost beaed system	prospective, cost driven system

B. Reimbursement System Objectives

States that have established Medicaid DRG systems had all identified a fairly common set of objectives that guided the development of their individual systems. In general, each of these states sought to establish a reimbursement system that would meet some, if not all, of the following objectives:

- maintain access to needed hospital care for Medicaid recipients;
- maintain the quality of hospital care;
- align the incentives offered to hospitals for the delivery of services with other large public payers, e.g., Medicare;
- control present and future Medicaid expenditures for inpatient hospital care;
- simplify state administration of Medicaid inpatient hospital benefits;
- minimize the potential for abuse of the Medicaid hospital payment system by providers;
- provide a standardized definition of a health care product and develop a standardized data base; and
- permit the fair allocation of finite resources, i.e., pay similar hospitals similiar amounts for the care of similar cases.

Developing a clear statement of objectives before addressing the design issues is important. The objectives should provide an important set of measures that will better enable state officials to:

- evaluate and select among options within a specific policy area; and
- assess the initial policy decisions to determine if they are consistent with system objectives. The simulation model described in Chapter 5 is an important part of this process.

The design issues to be discussed below may effect more than one objective, and the degree to which individual objectives are achieved may be influenced by design decisions. For example, the extent to which the financial risk of Medicaid hospital care is shared between the state and hospitals will depend partly on the type of diagnosis classification scheme used, the method used to group hospitals, and the recognition of individual cases with excessive costs or lengths of stay. Failure to coordinate decision making in each of these cases could result in unintended levels of risk shifted to individual hospitals, or, since risk creates incentives, it could create perverse incentives for providers.

C. Major Policy Issues

There are a number of major policy issues that must be discussed. They include:

- choice of case classification system;
- approaches to computing DRG relative weights;
- computation of prices;
- exclusion of certain DRGs, facilities, and/or costs from the system;
- development of special payments, including atypical cases, outliers, and transfers;
- approaches to hospital grouping; and
- other issues.

1. Choice of Case Classification System

There are several alternative case classification systems that might be used instead of DRGs. However, a state Medicaid program is small compared to Medicare and other payers. Since Medicare is using DRGs, hospitals are familiar with these categories. If a state selects a different set of categories, it could prove burdensome for hospitals. In addition, it may be useful to have compatible data across payers. Therefore, these other classification systems are probably not realistic alternatives to DRGs, at least in the near term. (These alternatives are outlined in Appendix A.) Many small states will face a particular problem -- insufficient data to accurately price all

the DRGs. Data limitations may require that some DRG categories be consolidated. For example, Minnesota consolidated the 468 DRGs into 37 broader categories. Table 3.2 lists the categories used in the Minnesota system and identifies the DRGs that are included within each of these larger groupings. While the sensitivity of consolidated groupings to different resource requirements has not been assessed, Minnesota believes this new structure will streamline administration of the reimbursement system. If the loss of sensitivity is not extreme, this approach could be useful. However, inability to discriminate between hospitals' resource requirements is a serious problem that should be assessed before this approach is used.

Additional alternatives that might be explored include obtaining relative weights from another source -- another state Medicaid program or the federal Medicare program, for example -- or pooling state data from several years to separate sufficient claims to price low-volume DRGs.

2. Approaches to Computing Relative Weights

A critical step in the development of a DRG-based reimbursement system is to calculate the relative weights to be assigned to each diagnosis classification (see Chapter 2). These relative weights, which represent a measure of the resources required for cases within each classification, are developed by analyzing hospital discharge data and cost reports. Cost data

Table 3.2
Diagnostic Categories Used in Minnesota
Medicaid Hospital Reimbursement System

Diagnostic Categories	DRG Numbers Within the Diagnostic Category
1. Diseases and Disorders of the Nervous System	(1-35)
2. Diseases and Disorders of the Eye	(36-48)
3. Diseases and Disorders of the Ear, Nose, and Throat	(49-74)
4. Diseases and Disorders of the Respiratory System	(75-97, 99-102)
5. Diseases and Disorders of the Circulatory System	(103-145)
6. Diseases and Disorders of the Digestive System	(146-183, 185-190)
7. Diseases and Disorders of the Hepatobiliary System and Pancreas	(191-208)
8. Diseases and Disorders of the Musculoskeletal System and Connective Tissues	(209-256)
9. Diseases and Disorders of the Skin, Subcutaneous Tissue and Breast	(257-284
10. Endocrine, Nutritional, and Metabolic Diseases and Disorders	(285-301)
11. Diseases and Disorders of the Kidney and Urinary Tract	(302-333)
12. Diseases and Disorders of the Male Reproductive System	(334-352)
13. Diseases and Disorders of the Female Reproductive System	(353-369)
14. Pregnancy, Childbirth and the Puerperium	(370, 374-384)
15. Newborns and Other Neonates with Conditions Originating in the Perinatal Period	(385-390)
16. Diseases and Disorders of the Blood and Blood-Forming Organs and Immunity Disorders	(392-399)
17. Myeloproliferative Diseases and Disorders, Poorly Differentiated Malignancy and Other Neoplasms NEC	(400-414)
18. Infectious and Parasitic Diseases (Systemic or Unspecified Sites	(415-423)
19. Mental Diseases and Disorders	(424-425, 427-429, 432)
20. Substance Use and Substance Induced Organic Mental Disorders (Ages 0-20)	(433-438)
21. Substance Use and Substance Induced Organic Mental Disorders (Ages > 21)	(433-438)
22. Injury, Poisoning and Toxic Effects of Drugs	(439-455)
23. Burns	(456-460)
24. Factors Influencing Health Status and Other Contacts with Health Services	(461-467)
25. Bronchitus and Asthma (Ages 0-1)	(98)
26. Bronchitus and Asthma (Ages 2-17)	(98)
27. Esophagitus, Gastruenteritus, Misc. Digestive Disorders (Ages 0-1)	(184)

Table 3.2 (cont'd)

28. Esophagitus, Gastruenteritus, Misc. Digestive Disorders (Ages 2-17)	(184)
29. Cesarean Section without C.C.	(371)
30. Vaginal Delivery with Complicating Diagnosis	(372)
31. Vaginal Delivery without Complicating Diagnosis	(373)
32. Normal Newborns	(391)
33. Depressive Neurosis	(426)
34. Psychosis	(430)
35. Childhood Mental Disorders	(431)
36. Unrelated Operating Room Procedure	(468)
37. Cases Which Could Not be Assigned to Other Diagnostic Categories	(469-470)

are used to assign a specific cost to each case, which is then assigned to a particular diagnosis classification. Average costs are then determined for each case, regardless of classification, as well as for each classification group. The ratio of the average cost for a classification group to the overall average cost yields the relative weight for that group. It should be noted that the geometric mean is the appropriate number to use in this calculation [1]. The reason that the geometric mean is preferred is that the distribution of average hospital costs is skewed and highly peaked, i.e., is lognormally distributed. In this instance, the geometric mean is a better and more stable measure of central tendency. In addition, cut-off points computed using the geometric technique (i.e., plus or minus three standard deviations) will not be negative on the low side. In other words, the geometric mean is more stable. Therefore, when the state recomputes its rates, relative values won't change much over time. In addition, the geometric cut-off points are more reasonable.

Data Base Options. States are faced with two broad options for computing relative weights. A state can:

- develop its own state-specific relative weights using Medicaid-discharge data and hospital cost reports; or
- adopt, either directly or in modified form, the relative weights developed by some other program (i.e., Medicare) for its DRG system.

The positive aspect of a state developing state-specific relative weights is that these weights will be based on the actual experiences of both the hospitals and populations to be affected. Theoretically, the weights should more closely reflect the resource requirements for that state's Medicaid population than weights derived from the other states. Organizations that challenge DRG rates face a more difficult time when the rates are based on the target population and hospitals. In addition, the weights will reflect certain policy decisions. For example, in Pennsylvania the weight for alcohol-related DRGs reflects detoxification but not treatment. Since these policies vary across the states, a general formula is not provided here. The major drawback of each state developing its own weights is that it is a massive undertaking, involving substantial amounts of staff and computer resources. Hospitals may argue for separate weights for each hospital or type of hospital (e.g., children's facilities). Computing specific weights for each hospital will strain data resources. Therefore, this is not a feasible option. Instead, the DRG prices can be tailored to fit individual hospital circumstances by making the prices hospital-specific while using statewide relative values.

The opposite set of arguments can be made with respect to the option of adopting relative weights developed by other programs. While this approach avoids a costly development step, opponents may argue that the weights may not accurately represent

the resources required to care for certain categories of problems. It can be argued, however, that the relative cost of caring for a patient in a given diagnostic grouping should not vary greatly across states. In fact, the federal Medicare program pays all hospitals on the basis of the same relative weights. However, a national data base is not available for Medicaid. A major policy decision point then is the decision whether to develop state-specific relative weights. Even if this were the case, overall hospital payments would not necessarily be different than they would have been under a more representative weighting system. Rather, the result might be that certain DRGs would be reimbursed at a rate below that required to cover the cost of appropriate care, while others might be reimbursed above appropriate levels. Depending upon the distribution of these DRGs across all hospitals, the net result would be that some hospitals would receive higher payments than they would under a system using more accurate weights, while others would receive less.

Aside from the issue of administrative costs, some states may be unable to develop their own Medicaid weights. To yield statistically valid results, each DRG weight must be based upon a minimum number of cases. States with smaller programs may not have enough cases in a recent year to develop valid weights for some DRGs. One approach to this problem would be to combine hospital discharge and cost data for several consecutive years --

inflating earlier year cost figures to a common base year -- to create a large enough data base. Michigan and Ohio used this technique and each developed a 600,000-claim data base; Pennsylvania based its weights on 700,000 discharges over three years. Unfortunately, this option may not be open to some states, if data from previous years is not compatible with later years' due to coding or data storage differences. Another solution would be to supplement Medicaid data with that from a comparable group, perhaps a nearby state or another insurer. The success of this approach would again, depend on the comparability of the two data bases.

States that do not develop their own DRG weights may wish to pursue one of the following alternatives:

- Adopt the DRG weights developed by another Medicaid program, preferably from a state with similar characteristics (e.g., recipient population, types of hospitals, urban/rural mix). With the growing number of state Medicaid programs that are developing their own state-specific Medicaid DRG weights, it should become increasingly easier for a state to find another state or states whose weights might be carried over and used.
- Combine data with one or more neighboring states, preferably with similar characteristics, to develop a set of regional Medicaid DRG weights.

- Adopt the DRG rates used by another non-Medicaid program, such as those developed by private entities (e.g., Missouri Blue Cross).

Policies in Medicaid DRG States. Four of the seven states that have DRG systems -- Michigan, Minnesota, Ohio, and Pennsylvania -- developed their own state-specific Medicaid DRG weights. The data sources that each state used for development of its relative weights are presented in Table 3.3. These states have relatively large Medicaid programs, and their data bases had enough cases to develop statistically valid weights for most DRG classifications. Nonetheless, certain adjustments had to be made. Ohio, for example, developed its weights using its Medicaid claims from a four-year period (1980-1983). For certain DRGs in which data was insufficient Ohio supplemented its own data with data from the Pennsylvania Medicaid and the Medicare programs. Pennsylvania was able to develop valid weights for almost all DRGs using its own claims data from a three-year period. The remaining DRGs were low volume and, therefore, of little financial consequence, so Pensylvania used its own weights for these as well.

Washington, Oregon, and Utah adopted the relative weights used by Medicare. Utah has a relatively small Medicaid program and might have experienced difficulty in developing its own set

Table 3.3
BASIS FOR ESTABLISHING RELATIVE WEIGHTS IN MEDICAID DRG STATES

RELATIVE WEIGHT

	MICHIGAN	MINNESOTA	OHIO	OREGON	PENN.	UTAH	WASH.
DATA SOURCES:	State-specific	Based on FY 83 & 84 data, will be hospital & population specific	used four years of Medicaid claims & cost data*	Used Medicare weights	State-specific	Used Medicare weights	Used Medicare weights

*Appended small cells with Pennsylvania and Medicare data.

of weights had it attempted to do so. Instead, the state's Medicaid program incorporated the weights used in the Medicare DRG system. Despite the fact that the Medicare population is very different from the Medicaid/AFDC population, Utah Medicaid was able to secure the state hospital association's support for the program. The state has been relatively pleased with the system so far. The hospital association's support for the system might have been influenced by the fact that prior to adoption of the DRG system, the state received a federal "freedom of choice" waiver to allow the state to selectively contract for inpatient hospital care for its Medicaid recipients. Given selective contracting as an alternative, the state hospital association may have viewed a Medicaid DRG system using Medicare weights as a more attractive option. Further, Medicaid only constitutes an exceptionally small percentage of Utah hospital revenues so the actual effects of Medicare vis-a-vis Medicaid weights are relatively small in that state.

The state of Washington used Medicare rates for the first year of its program, but it is now developing its own state-specific Medicaid weights. Oregon will also use the Medicare weights for the first year of its program which is scheduled to begin in October 1985. State-specific weights are attractive to hospitals because they reflect local patterns of Medicaid practice. Hospitals believe that payment rates developed from their data result in more accurate payment rates.

3. Computation of Prices

One of the positive aspects of prospective reimbursement systems -- including DRGs -- is that they give the state more control over benefit expenditures than traditional cost-based systems. A state may want to make an explicit determination of its spending target for inpatient hospital care as part of the process of developing the DRG rates, i.e., the budget for hospital payments that is available for the DRG system. This is the concept of a predetermined pool of money that is available for DRGs. Following are two ways that this amount might be computed. It is critical to note that this decision must consider federal guidelines that prescribe payment rates. However, the law and federal regulations provide little guidance in defining these terms.

The Options. In establishing the spending target to be used to calculate the DRG rates, states' options fall within two broad categories. The spending target might be the amount that would have been spent in the coming year without DRGs, or it might include program savings from DRGs.

The first approach is "budget neutral": It sets a target which maintains Medicaid expenditures at the level they would have attained in the absence of the new system.

The alternate approach establishes a spending target which reduces expenditure levels below what they would otherwise have

been under the previous payment system. Technically, DRGs could also be used to increase program spending.

The decision as to which option will be selected will be strongly influenced by a state's current reimbursement system and its historical expenditure growth rate. A state which has experienced substantial increases in its Medicaid hospital expenditures under a cost-based reimbursement system might establish a target that incorporates a reduction in hospital payment growth rates. Conversely, a state that is moving to DRGs from a system that had already limited its hospital payments might simply maintain the controlled growth rate.

Whether the objective of a new DRG system is to maintain or reduce spending, the calculation of the budget target -- defined as the amount that is apportioned for operating costs across DRGs according to their relative weights -- involves more than a straight line projection of the prior year's inpatient hospital expenditures. From this amount, a series of deductions must be made to account for any costs that will not be incorporated into the final DRG rates. Capital and direct medical education costs are two examples of costs that might be deducted from these rates. Table 3.4 illustrates this process.

Michigan began with a $556 million estimate of Medicaid inpatient hospital expenditures for fiscal 1984/85. Another $30 million was added to represent third-party liability recoveries,

TABLE 3.4
STATE OF MICHIGAN'S
CALCULATION OF TARGET EXPENDITURE
LEVEL TO ACHIEVE DRG BUDGET NEUTRALITY

A.	Inpatient Hospital Budget Estimation - 1984/85 ($522 Million + 6.5% Inflation = $556 million)	$556,000,000
	Payments Made by Other Third Parties	+ 30,000,000
	Subtotal	$586,000,000
B.	Adjustments for Services Excluded from Operating Cost Calculation	
	- Hospital-based Physicians	10,158,128
	- Certified Registered Nurse Anesthetists	2,000,000
	- Capital Costs	54,495,600
	- Direct Medical Education Costs	23,414,838
	- Medicare Crossover Claims	15,000,000
	- Out-of-state Non-enrolled Hospitals	2,000,000
	- Outliers	7,400,671
	- Indigent Volume Adjustment	20,000,000
	- Appeals	10,000,000
	Subtotal	$144,469,237
C.	Amount Available for DRG Operating Per Case or Operating Per Diem Calculation (A minus B)	$441,530,763

yielding a beginning budget of $586 million. The state then subtracted costs that would not be included in the DRG rates. These excluded costs, plus funds to be set aside for indigent volume adjustments and appeals, totaled nearly $144.5 million. The target amount was $586 million minus these adjustments, or $441.4 million.

Whether target spending levels are met or exceeded will depend on whether the state experiences significant changes in the volume of Medicaid admissions or changes in the types of admissions. The latter could come from changes in the Medicaid population case mix or through the upgrading of case codes by hospital staff to higher, more profitable DRG classifications -- this is known as "code creep" or "DRG creep." In anticipation of this code creep, Michigan reduced its DRG rates by 4.465 percent [2] to maintain its target expenditure level.

Note that budget neutrality estimates focus solely on inpatient hospital expenditures. If the DRG incentives encourage hospitals to discharge Medicaid patients earlier to the care of nursing homes or home health agencies, Medicaid expenditures for these and other home care services might increase. This will offset, to some degree, the effect of the DRG system on inpatient hospital expenditures. To date, no state has included increases in other related areas as offsets to its DRG budget.

A critical determinate of budgetary effectiveness is the establishment of a predetermined amount of money available for

DRG payment. This should be accomplished early in the development process. If the state establishes an amount, then system design decisions can be made in the context of a state budget policy. In other words, while a particular decision might advantage or disadvantage certain hospitals, alternative approaches would be structured so that the state's spending total will not change as a result of choosing one option over another. The alternative would be to allow system design decisions to change the DRG budget amount. The fixed budget concept is, therefore, different from a budget environment in which one hospital can receive more because the state will spend more. Under traditional hospital payment systems, all hospitals can freely push for more exceptions and special payments because the resulting additional costs come from elsewhere in the state budget or from tax increases -- not from the hospital budget. Hospitals can support each other in these requests since DRGs can effectively allocate a fixed sum of money among hospitals. Failure to establish a predetermined sum available for hospital payments may defeat one of the goals of DRG prospective payment -- budget control. It may also make it much more difficult for Medicaid administrators to negotiate system design issues with the hospital industry. State policies should provide a clear cut budget environment within which the details of a DRG system can be designed and implemented.

Policies in Medicaid DRG States. Of the seven states with operational or proposed Medicaid DRG systems, three states (Michigan, Oregon, and Pennsylvania) designed their systems to be budget neutral, while three states (Ohio, Utah, and Washington) sought to reduce the rate of growth in hospital expenditures (see Table 3.5). Ohio had averaged 15 percent increases in its Medicaid inpatient hospital expenditures for several years. Its spending target under the DRG system incorporates annual growth of 7.5 percent. Similarly, the seventh state -- Minnesota -- hopes to hold spending increases within a legislatively mandated 5 percent cap.

4. Inclusions/Exclusions

A state may exclude certain DRGs from its fixed price payment system and/or exclude certain facilities or certain costs.

a. Excluding Certain DRGs

Some case types are particularly difficult to classify. Prominent among these case types include mental health, drugs, and alcohol. For these cases, the patient's diagnosis conveys little information about treatment. The characteristics of mental hospital inpatient populations are often substantially different from the mentally ill population served in general hospitals. The most frail and vulnerable mentally ill within a given diagnostic category tend to be concentrated in a few

Table 3.5
BUDGETARY OBJECTIVES OF MEDICAID DRG STATES

	MICHIGAN	MINNESOTA	OHIO	OREGON	PENN.	UTAH	WASHINGTON
WHAT WAS INTENT? BUDGET NEUTRAL, REDUCTION, INCREASE?	Budget neutrel	Control spending within legisletive cap	Hold rate of growth to 7.5%/yeer	Budget neutrel	Budget neutrel	Reduction in spending	5% reduction in spending

teaching hospitals or in state hospitals. Further, treatment for psychiatric conditions varies widely across physicians. Unlike most medical problems, where treatment plans for identical patients would be very similar, in psychiatric cases the treatment plan varies by the physician's school of thought. Thus, the same patient admitted to different hospitals could expect different treatments at each hospital. Since there is no general agreement among physicians as to the best course of treatment for most of these cases, and since a DRG fixed payment rate requires some treatment homogeneity, it is generally difficult to include these cases in the payment system.

Drug and alcohol cases require detoxification, then treatment. Detoxification can be included in the DRG payment system because it is a well-defined process. However, treatment for drug and alcohol problems is at a similar stage in its development as treatment for mental disorders. Thus, DRG payment for drug and alcohol treatment is also problematic.

In some instances, this might mean that no price is set for these DRGs. These cases would be treated separately and would be paid on another basis. Alternately, a price could be set for these DRGs at a pre-determined level, such as two days, so the hospital could stablize and transfer the case. Or, hospitals could be paid differently depending on the role in the treatment of these types of cases. In any event, the point is that these cases require special handling. The easiest way to do this is to

exclude hospitals and units in which these cases are treated from the DRG system.

b. Excluding Certain Facilities [3]

For a Medicaid DRG system to have the widest impact, its principles must be applied to as many cases as possible. However, there are instances in which it may be appropriate to exclude certain facilities from the program. These exclusions may be justified if:

- There is extreme and unusual variability among the resources required to treat patients in particular hospitals, and this variation is unrelated to DRGs as currently specified. The variation, however, must be clearly related to hospital or facility type.
- Including cases from certain hospitals will lead to bias in the pricing of DRGs for other hospitals, and, therefore, will distort the incentives for efficient care.

Before determining that a facility or class of cases should be excluded from the DRG system, consider other areas of design flexibility discussed in this chapter -- special treatment of certain costs, peer grouping, payments for atypical cases (outlier payments), and other policies. Only when these adjustments would not rectify the problems should exclusions be considered.

At present, a DRG-based payment system may not be appropriate for the following types of facilities:

- free-standing rehabilitation hospitals, long-term care hospitals, and psychiatric hospitals;
- children's hospitals;
- special units within general hospitals;
- out-of-state hospitals; and
- health maintenance organizations.

Each has special characteristics that require special consideration:

- Free-Standing Rehabilitation Hospitals, Long-Term Care Hospitals, and Psychiatric Hospitals. Diagnosis-related groups divide patients into clinically coherent groups that use similar amounts of resources. The patient's diagnosis is the primary grouping variable. It is difficult to attain the desired clinical and economic coherence when classifying patients in psychiatric, rehabilitation, and long-term care hospitals. For example, the treatment provided in these facilities is generally long term, with great variation in patient length of stay. The different lengths of stay are affected by the patient's marital status, income, and access to support services at home or in the community. These dimensions are not well described by the patient's principal diagnosis or procedure.
- Children's Hospitals. Questions have been raised concerning the applicability of DRGs to children's hospitals. Those doubts are based on a number of

assertions.

DRGs do not adequately account for the illnesses faced by children. In general, there has not been an adequate breakdown of categories for that age group. DRGs commonly group people above age 70, and often, group those under age 18. Additional splits may be needed for children's hospitals.

Second, these hospitals are oriented toward very sick children. They receive more cases with greater than average severity, and fewer cases with less than average severity. Thus, within individual DRGs as currently defined, children's hospitals care for cases that require the most costly resources, including special procedures and intense nursing care.

Third, stand-by costs at children's hospitals are substantial. It is impossible to allocate those costs by diagnosis. For example, intensive care may be available for all patients, although the likelihood of use may vary according to DRG. The availability of these expensive units is a benefit for everyone who may need this type of service.

Unfortunately, there has been little study of these assertions so verification is not yet possible. However, limited data do seem to corroborate the need for special consideration. For example, these problems can be ad-

dressed by providing each children's hospital with its own hospital specific prices. This is equivalent to making each children's hospital its own peer group, and is the course followed by Pennsylvania, Ohio and Michigan.

- Special Units Within General Hospitals. Acute care general hospitals often include distinct units within the hospital that provide psychiatric, alcohol, and physical rehabilitation services. There are problems with using DRGs for cases treated in those units. Psychiatric patients in distinct units are not likely to represent the same demand for resources as psychiatric patients in acute care hospitals. Both their length of stay and per-day cost differ from that of patients treated in general medical/surgical beds. Including cases treated in psychiatric units may distort the price structure for psychiatric care within hospitals and among different hospitals. If costs (per claim) are greater for patients treated in medical/surgical beds than for those treated in psychiatric units, inclusion of a mixture of cases in the calculation of the DRG rate would price the cases treated in the former too low and in the latter too high. This distortion in relative prices would encourage the provision of care in distinct units, and discourage the provision of psychiatric inpatient care to Medicaid patients in areas where separate psychiatric units are not available.

Rehabilitation unit cases are distributed over a diverse set of DRGs and cannot be identified from claims data used to develop DRG prices. Their per-case cost also may be expected to vary systematically from the per-case cost for a patient who has the same DRG and is treated in general medical/surgical beds.

Arguments can be made for including these units within the DRG system. For example, the DRG prices reflect the total range of services available at hospitals, and, therefore, any distortion introduced through the inclusion of a small subset of patients and special care units will be minimal. In addition, including psychiatric and rehabilitation services in the DRG rate will encourage their use where appropriate and therefore lead to reduced Medicaid cost when rebasing takes place. (Rebasing is recomputing the prices from more recent data in some future year.)

Inclusion of psychiatric and rehabilitation unit patients in the DRG rate is consistent with DRG program objectives, because inpatient services have historically been reimbursed without distinction between the units in which care has been provided. The care provided in these units (as well as in freestanding facilities providing similar care) may represent a substantial portion of a state's Medicaid budget. Thus, this decision will matter.

- Out-of-State Hospitals. States that pay for a substantial amount of care in hospitals located outside the state may wish to include these in their DRG system. Statewide rates or rates that vary with volume are appropriate. DRGs might also cap otherwise unlimited reimbursements to out-of-state hospitals if this reimbursement is cost- or charge-based. New Jersey pays the state's DRG rate or 95 percent of the other state's Medicaid rate per day. Pennsylvania and Ohio pay their own DRG rates to out-of-state hospitals.
- Health Maintenance Organizations. Health Maintenance Organizations already have strong incentives to control hospital costs, and in fact negotiate their own rates with hospitals. Therefore, requiring HMO to reimburse hospitals at the DRG rate might prove an unnecessary intrusion into their relationship with individual hospitals. On the other hand, giving HMOs an option to pay state Medicaid rates might provide the HMO with additional leverage for HMOs to reduce their own as well as state expenditures for hospital services.

Table 3.6 indicates those classes of facilities that have not been included in the seven proposed or operational Medicaid DRG systems. For example, four states decided to include children's hospitals under the DRG system.

Table 3.6
FACILITIES EXCLUDED/INCLUDED IN MEDICAID DRG STATES

	MICHIGAN	MINNESOTA	OHIO	OREGON	PENNSYLVANIA	UTAH	WASHINGTON
CHILDREN'S HOSPITALS:	Included with hospital-specific rates	Proposing no exclusions of any type	Included with hospital-specific rates	Excluded	Included with hosp. specific rates	Excluded	Excluded
DISTINCT PART PSYCH UNITS:	excluded		included with special weights using data from hosp.'s	excluded	excluded	included	excluded
DISTINCT PART REHAB UNITS:	included**		included with appeal provision*	excluded	included as part of acute care	included	excluded
OUT-OF-STATE HOSPITALS:	excluded		included within 2 separate peer groups	included	included with PA. statewide average rate	included	included unless they meet test for exclusion
HMO'S:	excluded		excluded	excluded	excluded	excluded	excluded
FREESTANDING PSYCH AND REHAB HOSPITALS:	excluded		excluded	excluded	excluded	excluded	excluded
EXTENDED CARE FACILITIES:	excluded		excluded	excluded	excluded	excluded	excluded

*DRG specific appeal where hospital must show mean cost and LOS is 30% above state's basic adjusted charge.
**Plan to pay in the future on prospective per diem basis.

c. Excluding Certain Costs

A state may determine that certain types of costs relate more to individual facilities' circumstances than to the facilities' operating costs associated with patient care. For this reason, a state may elect to not include these costs in the calculation of the relative weights for individual DRGs. These costs would therefore have to be incorporated into the pre-admission amount paid to hospitals through some means other than the relative weight-based operating cost component [4].

The costs that might be excluded include such items as capital, medical education costs in teaching facilities, and uncompensated care costs. These costs have been excluded by most of the current state programs. In general, individual costs not included in the DRG operating cost component can be dealt with using the following broad approaches:

- a direct pass-through of actual costs;
- establishment of a hospital-specific prospective rate;
- a standard allowance, calculated as either a flat-dollar amount or as a percentage of some base figure, such as a DRG's operating cost component;
- an allowance which distributes a fixed amount of money among facilities based upon the individual facility's portion of total statewide expenditures level for that cost item; or
- some combination of the above.

Whether and in what manner specific costs should be handled outside the basic DRG operating cost calculation will depend heavily on a state's view of the issues associated with each cost category. Presented below are brief discussions of several costs that have been dealt with outside of the operating cost calculation in at least one of the operational Medicaid DRG systems.

- Capital costs have often been singled out for special treatment under DRG systems. These costs for a particular hospital reflect investment decisions and market conditions at the time those decisions were made, rather than that hospital's direct operating efficiencies in caring for different types of patients. Although one of the goals of a DRG reimbursement system is to make hospitals use their resources more efficiently, it is recognized that a hospital administrator's ability to restructure a hospital's capital component is far more limited than his or her ability to affect operating costs. This is particularly true of the costs of buildings and fixed equipment, but less true for movable equipment (usually medical diagnostic or treatment equipment), since costs for movable equipment are generally amortized in less than ten years. In addition, movable equipment costs are related to the hospital's case mix, while capital costs for buildings and fixtures are related only to the age of the facility.

Including capital costs directly within the DRG payment is likely to result, at least in the short term, in inequities across facilities with similar operating costs and vastly different capital financing requirements. To avoid this problem, Congress allowed capital costs to be treated as a pass-through under the Medicare DRG system. However, over time, a facility will have an incentive to overuse any resource that is excluded from the DRG rate (as a pass-through) if the resource can effectively be substituted for resources included within the DRG rate. For this reason, Congress instructed the Health Care Financing Administration to prepare a report recommending a more permanent solution to handling the capital issue within the Medicare DRG system. This report, due in October 1984, is expected to be delivered to Congress in the near future. Its recommendations may be of interest for state programs.

Three of the seven Medicaid DRG programs -- Michigan, Minnesota, and Utah -- treat capital expenses, including major movable equipment, as a pass-through cost. A capital pass-through is a reasonable state option pending federal resolution of Medicare capital reimbursement policy. Pennsylvania added movable equipment capital costs to its DRG payment rate, and only passes through capital expenses for buildings and fixtures. Movable equipment costs will reasonably vary with case mix. Therefore, including this cost component is conceptually straightforward. Washington developed its DRG rates on a

hospital-specific basis and included capital within the DRG rate. Ohio attempted the most innovative approach to handling capital costs. That state proposed to reimburse capital as a percentage of the base DRG rate, with the percentage varying according to the age of the facility. Although Ohio did not adopt this methodology, but rather established an add-on factor to the DRG prices, its original proposal is an innovative approach to a complex issue.

Medical Education Costs. A second group of costs that have been given special treatment are those directly attributable to medical education programs, including salaries of residents, teaching salaries, continuing education costs, and others. Congress' immediate response to the question of how to handle these costs under the Medicare DRG system was to treat them, at least temporarily, as a direct pass-through, that is, to pay these costs as incurred at any level. The attention given to medical education during this process, however, has spurred Congress to hold hearings on the broader issue of whether medical education should continue to be financed through the reimbursement system or whether it should be replaced by another more direct and controllable method.

All state Medicaid DRG systems have followed Medicare's lead and have treated direct medical education costs as a pass-through to be added to the base DRG rate. In addition, Ohio and Pennsylvania also established separate peer groups for major teaching

facilities, as did New Jersey. Ohio also adjusts costs based on the ratio of interns and residents to hospital size. This accounts for the higher patient care costs associated with the indirect teaching costs of graduate medical education. The adjuster is used to compute a percentage add-on to the DRG rates for teaching hospitals, much like the Medicare indirect teaching adjustment from which this technique is derived. Establishing separate peer groups for teaching facilities or using an indirect cost adjustment mean that teaching hospitals will be paid much more per treated case than other hospitals. This extra payment is in addition to the pass-through payment for direct medical education costs, including salaries of residents, faculty salaries, and overhead costs.

Care for Low-Income Patients. The language in P.L. 97-35, the law that allows states to establish innovative Medicaid hospital reimbursement systems like DRGs, also requires that these systems somehow take into account the needs of hospitals serving a "disproportionate number" of low-income patients. Thus, in addition to having separate components for capital and/or medical education costs, two states also provide some adjustment in their reimbursement to hospitals providing substantial amounts of care to low-income patients.

For example, the state of Michigan set aside $20 million from its budget-neutral spending target to finance an indigent volume adjustment. This sum is redistributed to hospitals

according to each hospital's ratio of Medicaid, crippled children, resident county hospitalization, and bad debt charges to total inpatient charges, as compared to the statewide average. This adjustment is calibrated to spend exactly $20 million. A waiver from the Health Care Financing Administration is required for this type of adjustment, because such payments might result in a state paying more for care than it would if it used Medicare principles -- which do not include payments for non-Medicare bad debts and charity care.

Minnesota increased the adjusted base-year cost per admission for hospitals in which Medicaid or general assistance patients make up more than 15 percent of total admissions. This adjustment is made on a sliding scale basis (see Table 3.7).

Table 3.8 summarizes state policies for capital, medical education, and indigent care. Of particular interest is the capital policy in Washington, which include capital in its rates. Utah is moving in this direction, and Ohio has developed an add-on factor for capital.

Table 3.7

Minnesota Disproportionate Share Formula

Percent of Total Admissions Which are Medicaid or General Assistance Care	Increase in Adjusted Base Year Cost Per Admission
15-20 percent	.25 percent for each percentage point above 15 percent
21-25 percent	.5 percent for each percentage point above 20 percent
26-30 percent	.75 percent for each percentage point above 25 percent
31 percent and above	1 percent for each percentage point above 30 percent

Table 3.8
COSTS GIVEN SPECIAL TREATMENT IN MEDICAID DRG STATES

	MICHIGAN	MINNESOTA	OHID	OREGON	PENN.	UTAH	WASH.
CAPITAL:	CAPITAL & MED.ED.: PRDSPECTIVE PER CASE AMDUNT INCLUDED WITH DRG; PAYMENT TD BE SETTLED LATER	PASS-THRDUGH	ADD-ON FACTDR TD RATES; PRDSPECTIVELY SET.	CAPITAL & MED. ED.: RETRDSPECTIVE PASS-THROUGH AT END OF EACH QUARTER BASED ON HISTORICAL	PASS-THROUGH	PARTIAL PASS THROUGH UNTIL 6-30-85, THEN RDLLED IN DRG	INCLUDED IN HOSPITAL SPECIFIC DRG'S
MEDICAL EDUCATIDN:	BASED ON ACTUAL COST	SUBJECT TD INDEXING; ED. CDSTS IN BASE YR. RDLLED OVER	ADD-DN FOR FACILITIES W/ MED. ED. PROGRAM	% DF REIMBURSEMENT	PASS-THROUGH WITH CAPS	PARTIAL PASS THROUGH UNTIL 6-30-85, THEN ROLLED IN DRG	INCLUDED IN HOSPITAL SPECIFIC DRG'S
INDIGENT CARE ADJUSTMENT:	$2D MILLION DISTRIBUTED TO HDSPITALS ACCORDING TD RATIO OF INDIGENT CARE CHARGES TO TDTAL INPATIENT CHARGES.	ADJUSTED BASE YR. COSTS INCREASED FOR HDSP. WITH >15% MEDICAID AND/DR GEN. ASSISTANCE MED. CARE ADMITS	NDNE	NONE	TAKEN INTO ACCOUNT IN GROUPING PROCESS	NONE	NDNE

5. Special Payments for Special Cases

a. Outliers [5]

Outlier cases are cases which are unusually expensive to treat; that is, cases which are atypical for a DRG. Under a prospective payment system, an outlier policy may be thought of as a form of reinsurance. The program provides insurance for hospitals against the high costs of these cases. This insurance should function as a stop-loss, i.e., the hospital should not lose more than a defined amount for the treatment of these cases. The purpose of this reinsurance is twofold:

- To increase hospital acceptance of DRGs by limiting the risk to which they are exposed, and
- To reduce the incentive for hospitals to refuse to admit cases which might be more difficult (and costly) than average to treat. The outlier policy may be useful for particularly difficult DRGs, such as burn care and neonatal care. The simulation model described in Chapter 5 is a useful technique for identifying these situations.

Short-stay/low-cost outliers might also be identified and paid separately. The purpose of this would not be to protect the hospital against high-cost care, but to protect the state against paying the full DRG rate for a one-day admission.

The outlier issue consists of two components, and requires two distinct decisions. The first concerns how outliers will be identified and paid under the prospective payment system within the state. The second addresses handling outliers at out-of-state hospitals.

The first issue, however, is whether to use the federal outlier definitions or to develop independent criteria to identify and pay for these cases. The following discussion focuses on long-stay, high-cost outlier cases. Short-stay, low-cost cases could also be identified as outliers and paid separately, as is done in New Jersey. This is based on a medical concept of outlier cases, not on the reinsurance concept described above. (A medical outlier is a case that is clinically atypical for the DRG. This concept is useful for both utilization review and hospital management.)

Identification of Outlier Cases - Medicare. Identification of an outlier case is based on two types of criteria: length of stay and total treatment cost. Trim points are the cut-off points outside which a case is an outlier. Medicare is required to provide an additional payment for any discharge which exceeds the mean length-of-stay in its DRG by some fixed number of days (17), or exceeds the mean length-of-stay in a DRG by some fixed number of standard deviations (1.94), whichever is less. Thus, these are the Medicare outlier trim points. Alternatively, for a case not identified as an outlier by the length-of-stay criteria,

a hospital may request additional payments when its costs exceed a fixed multiple of the DRG payment rate (currently two times) or exceed a fixed dollar amount ($15,000), whichever is greater. Medicare does not recognize short-stay outliers because the purpose of Medicare's outlier policy is to provide reinsurance for exceptionally costly cases. Under a medical concept of outlier cases, short-stay cases would be recognized as atypical for most DRGs.

Payments for Outlier Cases - Medicare. Federal law requires that the payments for outlier cases approximate the marginal cost of care beyond the cut-off point. Marginal cost is the cost of producing an additional unit -- however defined. Although this may appear to be an easy concept to implement, difficulties arise from two sources. First, marginal cost is influenced by the time period under consideration. For long time periods, marginal cost approaches average cost, but, when shorter time periods are considered, marginal cost is much less than average cost. This difference occurs because, over long time periods, more things (staffing, equipment, etc.) can be changed in response to volume changes. Second, marginal cost will be lower if the volume change is unexpected instead of foreseen. In this context, it seems reasonable to assume that marginal cost refers to the cost of short-term transitory or unexpected change in volume. Empirical estimates of marginal cost are based on cost functions using either time series or cross-section data. Cost

functions based on time series data estimate short-run marginal cost, while estimates of long-run marginal cost are provided by cost functions based on cross-section data. However, since Medicare program data does not contain information on total patient volume, the 60 percent estimate of the ratio of marginal cost to average cost used by Medicare is derived from a review of hospital cost function literature.

Length-of-Stay Versus Cost Outliers -- Two Problems. The Medicare program defines both length-of-stay and cost outliers. In this system, length of stay overrides cost. That is, a case that qualifies as an outlier on both counts is paid under the length-of-stay criteria. Since the key rationale for payment for outlier cases is financial protection, it would seem logical to make cost the primary criteria. However, length of stay is highly correlated with cost, and length of stay is easier to measure than cost factors. Length of stay is much simpler to review -- it's easy to say a day of care is not necessary, harder to say a particular test was not needed. Length of stay is generally more difficult for a hospital to manipulate than charges. Therefore, Medicare emphasizes length-of-stay outliers, and these account for about 85 percent of total outliers.

However, the decision to let length of stay override cost creates a potentially anomalous situation for a hospital. Imagine a case that qualifies for significant additional payments as a cost outlier. If this case stays one day past the length-

of-stay cut-off point, the hospital will receive 60 percent of one day's payment. Medicare also uses a single, national cost-to-charge ratio (0.74). Their failure to adjust charges to specific costs at specific hospitals creates a clear incentive for hospitals to raise charges to more than this ratio above cost. The Medicare system does not adjust charges to cost on a hospital-specific basis because this was believed to be too burdensome for hospitals.

Defining and Paying for Outliers. The range of options for defining and paying for outliers is virtually limitless.

The design options available to states include the following:

- decide whether or not to have special payment policies for cost and/or length-of-stay outliers;
- decide whether or not to have special payment policies for low-cost/length-of-stay outliers, as well as those at the high end of the scale;
- determine threshold values for identifying outliers; and
- establish payment levels for cases identified as outliers.

Medicare's outlier policies provide a sort of baseline for discussion. Table 3.9 lists the special payment policies for the prospective payment states. Note that Washington and Oregon do not recognize length-of-stay outliers. Pennsylvania defines a

Table 3.9
OUTLIER POLICIES UNDER MEDICAID DRG PAYMENT SYSTEMS

	MICHIGAN	MINNESOTA	OHIO	OREGON	PENNSYLVANIA	UTAH	WASHINGTON
IDENTIFICATION:							
LOS	3 s.d.'s, except burns and neo-natal are 2 s.d.'s	3 standard deviations (3 s.d.'s)	2 s.d.'s above GM except neo-natal are 1 s.d. **	No special payment for LOS outliers	1.94 s.d.'s or 22 days	1.94 s.d.'s or 22 days	No special payment for LOS outliers
COST	No special payment for cost outliers	only burn + neo-natal cost outliers ****	2 standard deviations of state mean same as above	Under development	Only burn and neo-natal cost outliers	No special payment for cost outliers	> $12,000 or 1.5 (times?) of DRG rate
PAYMENT*:							
LOS	60 percent of per diem	60 percent of per diem	60 percent of per diem 80 % for neo-natal ***	No special payment for LOS outliers	60 percent of per diem	Minimum of 60 percent of per diem	No special payment for LOS outliers
COST	No special payment for cost outliers	60 percent of cost	60 percent of adj. cost: LOS overridee cost	Undecided	100 percent of cost	No special payment for cost outliers	80% of cost

* Payments refer to payments made for days or costs exceeding trim points.

** All states except Michigan use the geometric mean. Michigan uses the arithmetic mean.

*** Calculated as (hospital DRG)/geometric mean of LOS for that DRG.

****Burn is 3 s.d.'s, neo-natal is 1 s.d..

DRG as eligible for length-of-stay outlier payments or cost outlier payments, but never both. Thus, in Pennsylvania only burn and neonatal cases are eligible for cost outlier payments, and these payments are 100 percent of the costs that are in excess of twice the DRG rate. This recognizes the highly variable nature of cases in these DRGs. Michigan also recognizes burn and neonatal DRGs, but by Michigan's outlier criteria uses a two-standard deviation for these DRGs, instead of the state's normal three-standard deviation definition. Like Medicare, Michigan defines only length-of-stay outliers in that it uses only statistical criteria rather than an absolute day limit.

The Michigan approach is much simpler than Medicare's. The statistical cut-off points will be widest for DRGs with the largest variation, i.e., DRGs in which protection is most needed. Pennsylvania followed Medicare more closely, except that specific DRGs are eligible for either length-of-stay or cost outlier payments, but not both. This solves the problem with the length-of-stay outliers overriding cost outliers. However, since most DRGs are only eligible for length-of-stay outlier payments, the Pennsylvania approach is less generous than a cost-outlier-only policy. A length-of-stay outlier identification policy is simpler to operate because while length-of-stay is not ambiguous costs are.

b. Transfer Cases

Transfer cases are cases admitted at one hospital and discharged to another hospital. The issue here is what payment, if any, will be made to the transferring hospital.

Transfers usually occur when a hospital does not have the specialized equipment needed to treat a particular patient. Since DRGs are intended to encourage specialization among hospitals, the transfer payment policy should not penalize a hospital that transfers a case. In this context, it is important to note that two DRGs assume that patients will be transferred from a community hospital to a medical center for treatment. These are DRGs for transfer of burn patients to acute care facilities (DRG 456) and transfer of immature babies (DRG 385).

However, a common pattern for these cases is transfer from community hospital to medical center for treatment, and then transfer back to a community hospital near home for continued treatment and recuperation. The state's transfer policy should recognize this pattern. Oregon, for example, proposes to pay both hospitals a per diem. Thus, if the patient is transferred back to the community hospital and discharged, the discharging hospital will be paid the full DRG rate, minus its initial per diem payment.

There are two primary options for this issue: increase the DRG rates slightly and let the receiving hospital pay the transferring hospital a negotiated rate, or set aside monies to

pay a per-diem rate (not to exceed the DRG rate) to the transferring hospital. The latter course of action will tend to encourage transfers, and, therefore, specialization. However, this policy is also subject to abuse by hospitals, and it would require utilization review.

Transfers may also be used to dump unprofitable cases onto public hospitals. This possibility should be carefully monitored.

Individual state Medicaid policies concerning transfers are summarized in Table 3.10. Most of the state DRG payment systems pay the transferring hospital on a DRG per-diem basis, not to exceed the full DRG rate, and subject to utilization review. In most cases, the discharging hospital receives the full DRG rate. However, Minnesota and Ohio pay the receiving hospital a per diem rate, and Oregon's DRG rate is subject to an eighteen-day cap. Utah pays the full DRG rate and guarantees at least 60 percent of billed charges. Thus, the hospital could receive more than the DRG rate in Utah.

6. Peer Grouping of Hospitals

The development of DRG prices using data from hospitals with similar characteristics represents an attempt to minimize the variation in costs within each group. The method used to establish peer groups would seek to cluster facilities that could be

Table 3.10
TRANSFER POLICIES UNDER MEDICAID DRG PAYMENT SYSTEMS

PAYMENT MADE:	MICHIGAN	MINNESOTA	OHIO	OREGON	PENNSYLVANIA	UTAH	WASHINGTON
TO TRANSFERRING HOSPITAL:	HOSPITAL-SPECIFIC PER DIEM NOT TO EXCEED DRG RATE	PER DIEM	PER DIEM	PER DIEM ON BASIS OF DRG	CALCULATED PER RATE UP TO FULL DRG*	PER DIEM	PER DIEM
TO DISCHARGING HOSPITAL:	FULL DRG	PER DIEM	PER DIEM	FULL DRG**	FULL DRG	MINIMUM OF 60% OF BILLED CHARGES ***	FULL DRG

* Other than burn and neo-natal, which get full DRG. Transfer billed to special DRG.

** Oregon has an 18-day limit/year for Medicaid clients. Full DRG reimbursed only if admission is before the end of the 18-day limit.

*** Will calculate per diem for DRG, and pay minimum of 60% of billed charges; if DRG rate is higher than the 60%, will pay DRG rate.

expected to provide services at similar cost levels, taking into account factors such as wage levels, other input costs, payer mix volume, and other variables believed to affect cost. Medicare uses a simple grouping system, dividing hospitals by urban or rural area, and region. The simplicity of this approach is appealing. States may wish to be more sensitive to special needs of local hospitals since each state deals with far fewer hospitals than Medicare. The additional complexity introduced by grouping is perhaps more tractable at the state level.

In addition, the use of peer groups helps states meet the (vague) federal requirement that state Medicaid hospital reimbursement rates reasonably and adequately reflect the costs incurred by efficient and economically operated facilities.

The variations for peer grouping hospitals are limitless. They range from the extreme of including all facilities within the same peer group to recognizing each individual facility as its own peer group. Including all hospitals in one peer group (i.e., statewide rates), is likely to create big winners and big losers as some hospitals find the DRG rates either much higher or much lower than their actual costs. Under this approach, low-cost hospitals would have a great incentive to expand their Medicaid business, while high-cost facilities would face substantial reductions in payment regardless of their actual efficiency. The savings to be achieved by the state would come entirely from the high-cost facilities. Making each facility its

own peer group (i.e., hospital specific rates) substantially reduces the risk faced by individual facilities by establishing hospital-specific rates for each DRG-based on each facility's historical costs. However, under this approach, hospitals which have been efficient, and therefore low-cost, are penalized by low rates while historically inefficient hospitals are rewarded with high rates.

The methods of establishing peer groups range from simple, logical groupings of hospitals to statistically complex approaches. In general, however, there are two:

- Group hospitals based upon a limited number of characteristics widely accepted to relate to cost of service. Bed size, location, teaching, and public ownership are examples of characteristics that might be used for classification. The internal similarity of the resulting groups, relative to cost and any other factors of concern, e.g., case mix, is then evaluated. Limited adjustments may be made to these groups, if necessary, although this will be questioned.

- Apply statistical procedures, such as regression or cluster analysis, to identify similar groups. One new approach, called "grade of membership," combines the

virtues of continuous adjustments with the virtues of hospital groups, all in a statistically valid model. A discussion of this technique is provided in Appendix B.

Whatever the approach used, the variables typically used as criteria for clustering hospitals into peer groups include bed size, location, service capacity, and medical education responsibility.

The states with Medicaid DRG systems vary substantially in their approach to peer grouping (see Table 3.11). Three of the states -- Michigan, Minnesota, and Washington -- establish hospital-specific rates, thereby essentially assigning each facility to its own peer group. However, at least one of these states (Michigan) sees this as an intermediate step and plans to eventually establish broader peer groups using blended rates (hospital-specific and group) as a transition mechanism.

Pennsylvania adopted a peer group approach that divides hospitals (other than children's hospitals) into seven different groups. This was based upon a fairly complicated statistical study performed by the state hospital association. This study analyzed hospitals according to thirteen different measures of

Table 3.11
APPROACHES TO PEER GROUPING IN MEDICAID DRG STATES

	MICHIGAN	MINNESOTA	OHIO	OREGON	PENN.	UTAH	WASH.
PEER GROUPING SYSTEM:	INDIVIDUAL FACILITY	INDIVIDUAL FACILITY (MAY GROUP LATER)	14 PEER GROUPS (WILL CHANGE AS OF 7-1-85)	ONE STATEWIDE PEER GROUP	7 PEER GROUPS	ONE STATEWIDE PEER GROUP	INDIVIDUAL FACILITY

four broad aspects: teaching status, Medicaid volume, environmental characteristics, and costs. The final groups, however, are similar to these that would be obtained if cost alone was the grouping variable. In addition to these seven hospital peer groups, each children's hospital in Pennsylvania is considered its own peer group.

For the first year of its prospective payment system, Ohio has divided its hospitals into the following thirteen peer groupings, using more conventional techniques. These groups are:

- major teaching hospitals;
- hospitals in metropolitan areas, except major teaching hospitals, which are divided into one of eight peer groups that vary according to wage rates;
- hospitals in non-metropolitan areas, which are assigned to one of two groups that differ according to facility size (less than one hundred beds versus one hundred or more beds);
- out-of-state hospitals are divided into two groups, depending upon the level of annual Ohio Medicaid payments they receive (less than $50,000 versus $50,000 or more); and
- children's hospital, in which each hospital constitutes its own peer group, (i.e., facility-specific rates are set for these hospitals).

7. Other Issues

Phase-in. The DRG system is a fundamental change in the payment system for hospitals. This change will redistribute large sums of money across hospitals. Hospitals, however, may need time to react to the new incentives created by a prospective payment system. One way to give hospitals time to adjust is to create a phase-in mechanism. A phase-in mechanism generally begins by setting separate payment rates for each hospital. In addition, a separate group or statewide rate is also computed. During the first year, each hospital's own individual rate is a large portion of its DRG payment rate. This protects the hospital against large changes in its revenues. The portion of the rate that is hospital-specific declines over time (e.g., 90 percent in year one, 80 percent in year two, 70 percent in year three, or 75 percent, 50 percent and 25 percent, etc.) As the hospital-specific rate is phased out, the peer group rate is phased in.

Since this occurs slowly over several years, hospitals are given more time to adjust to the new incentives and the new rates. The issues here are whether to have a phase-in or transition period at all, and, if so, what kind it should be. Multiple phase-ins, for capital and operating costs for example, may be appropriate.

Readmission. One problem with DRG prospective payment is that it tends to encourage admissions. Clearly, a hospital will fare better financially if it can convert one admission to two and double its revenue. However, in some instances a readmission is appropriate: for example, the patient contracts a new disease or has an accident. States that have implemented prospective systems cite this thorny issue often. A related issue involves two admissions for two unrelated procedures that could (and, under cost-based reimbursement would) have been combined into one admission. DRGs do not handle single admissions for multiple, unrelated problems at all. No matter how DRGs define acceptable readmissions, this will remain a problem.

Rebasing and Recalibration. Rebasing means recomputing the DRG prices from a newer data base. This might be done as often as yearly or as infrequently as once per decade. In essence, the purpose is to base DRG prices on actual hospital costs. While rebasing would keep price levels current relative to costs, it also could be viewed as a reversion back to cost-based reimbursement. Alternatively, a state might decide never to rebase and to base year prices over time based on measures other than total hospital costs (e.g., by using an input cost index). Rebasing is different than recalibration. Recalibration is recomputing the DRG relative weights. In effect updating the relative values to account for charges that have occurred over time. The purpose of recomputing relative weights is to allow

for changes in relative costs due to code creep and to allow for technical changes in the practice of medicine. Decisions to rebase and recalibrate are independent of each other. Medicare, for example, recalibrates but never rebases. Pennsylvania and Ohio do both. Small states may find yearly recalibration unnecessary and burdensome. Perhaps a biannual recalibration schedule would be appropriate for a smaller state. For larger states, the process should be entirely automated, and done yearly.

Table 3.12 describes state policies for recalibration and rebasing. These policies may not yet be fully developed since this issue develops a year or two after the system has begun.

Transplants. There are currently two DRG transplants for heart transplants and kidney transplants. A state might face two problems concerning transplants. First, new procedures are becoming available at a rapid rate - (liver transplants, for example). Second, it is unlikely that states will have data on which to base a rate for either a new transplant procedure or a heart transplant. Apparently, the only state that has faced this problem is Pennsylvania. They negotiated a rate with the hospital involved.

Table 3.12
RE-BASING AND RECALIBRATION POLICIES IN MEDICAID DRG STATES

REBASING

	MICHIGAN	MINNESOTA	OHIO	OREGON	PENN.	UTAH	WASH.
PLANS TO REBASE:	No date set	No plan to re-base due to legislative cap of 5%	Will re-base in 1986*	Undecided	No date set	No date set	Base rate updated by HCFA market basket

*Annual update uses Ohio hospital market basket inflation factor.

RECALIBRATION

	MICHIGAN	MINNESOTA	OHIO	OREGON	PENN.	UTAH	WASH.
RECALIBRATION POLICIES:		Will recal-culate every biennium	Will recal-culate in 1986	Will probably keep Medicare weights	Currently in process of recalibration	Will consider when sufficient data obtained	Developing state-specific weights

8. Eliminated Policy and Regulations

The DRG system requires a new set of hospital reimbursement policies. However, DRGs also allow some policies to be eliminated since they are no longer necessary or relevant. For example, Michigan was able to eliminate the need for many of its hospital regulations when it moved to a DRG-based reimbursement system. The policies Michigan deleted are identified in Table 3.13 and include cost limits, length of stay controls, and policies regarding routine tests. Under DRGs, there is little need to regulate inputs to the health care process since the state pays only for outputs.

TABLE 3.13

POLICIES NO LONGER IN EFFECT UNDER THE MICHIGAN MEDICAID PROGRAM
FOR HOSPITALS INCLUDED/EXCLUDED UNDER DRG REIMBURSEMENT

Policies	Hospitals Under DRG	Freestanding Psychiatric Hospitals	Rehabilitation Hospitals	Medicare-Certified Distinct-Part Psychiatric Units Of a General Hospital	State-Owned Psychiatric Hospital	Hospitals Located Outside The State of Michigan	
						Enrolled	Non-Enrolled
3-year Rebasing	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Routine Costs	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Operating Cost Limits	N/A	N/A	N/A	N/A	N/A	N/A	N/A
18/40 Inpatient Benefit Limit Policy, Including Form OSS-557	N/A	X	X	X	X	N/A	N/A
75 Percentile Length of Stay Review	N/A	N/A	X	N/A	N/A	N/A	N/A
Friday/Saturday Admission Policy	N/A	N/A	X	N/A	N/A	N/A	N/A
Routine Testing Policy	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hospital Grace Day Policy (i.e., up to 72 hours paid at the hospital's normal acute care rate while awaiting discharge to a long-term-care facility)	N/A	N/A	X	N/A	N/A	N/A	N/A
Private Room Policy	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Late Discharge Fee Policy	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nursery Special Billing Instructions for Diagnosis Codes V300-V390	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nursery Extended Stay of a Healthy Newborn When an Extended Stay for the Mother is Medically Necessary	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Adoptive Infants, Special Billing Instructions for Extended Stay After Mother's Discharge	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Medicaid Psychiatric Certification Beyond 18 Days, Utilizing Form OSS-3838	N/A	X	N/A	X	X	N/A	N/A

Key: "N/A" means that the policy does not apply.
"X" means that the policy does apply.

FOOTNOTES

1. The geometric mean is the Nth root of the product of N values, whereas the arithmetic mean is the sum of the (same) N values divided by N.
2. Medicare initially projected 3.4 percent and upgraded its estimate later. The actual level of code creep experienced by Medicare was higher (8.4 percent).
3. Portions of this section are drawn from an issue paper on exclusions prepared by the Ohio Medicaid program.
4. Naturally, these costs would have to be carved out of the base used for calculating the target DRG system expenditure level for operating costs.
5. This discussion draws upon an issue paper prepared by the Commonwealth of Pennsylvania.

Chapter Four

Managing the System Development Process: Philosophy, Workplans, and Skills

A. Introduction: Development Requires a Substantial Commitment

The development and implementation of a Medicaid DRG prospective payment system for inpatient hospital services requires a substantial commitment of staff time and computer resources. States that have already implemented these systems estimate that from 10,000 to 15,000 staff hours and 5,000 hours of computer time were required to design and implement their systems. States that draw upon the data developed by other states, rather than develop their own state-specific DRG weighting factors (see Chapter 3), may be able to reduce their development effort by perhaps 20 percent. Nonetheless, a state must make a significant commitment of resources to develop a system within a reasonable period of time.

A "reasonable" time frame for developing a system will depend upon a number of factors, including the extent to which the system will be based on state-specific Medicaid data, the availability of these data, and the political and public consultation processes to be followed. Medicaid officials in states that have DRG systems feel that nine months to one year is the minimum amount of time necessary to develop a state-specific system.

B. Public and Provider Involvement in the Decision-Making Process

Since many decisions will be driven by program constraints and the state's political environment, the method of program development and the process established to attain the goals and objectives of a DRG reimbursement system should be endorsed at the highest level possible. Once this is accomplished the implementation process can be determined. Two opposite approaches to implementation are internal or external. An external method involves the participation of agencies, associations, and other public entities in a developmental role. These groups are participants in the decision-making arena. In contrast, an internal method limits participation to essential personnel within the state agency. It does not allow for external intervention.

Policy analysis and decision-making can be done on an a-priori basis to some extent. However, many of the more technical decisions will be driven by the constraints of the system and the state's political environment. Technical system design decisions should be based on an analysis of relevant alternatives. This analysis should, where appropriate, utilize the simulation model to test and/or report on the alternatives. Ideally, the decision criteria are specified in advance, and the results of the simulation drive the decision-making process. This results in decisions that are more easily explained to the provider community as well as defendable in court.

Experience has shown that an effective decision method combines both internal analysis and external review. A state first defines the elements it must control in the development of a DRG program. For example, the concept of a fixed amount of money, to be distributed among providers, is extremely useful and should be established early in the process. Once system parameters are established and well defined, the state might usefully permit the involvement of other parties.

This is most easily accomplished by maintaining two distinct working groups: a core of state personnel and consultants who interact regularly, and a group of responsible representatives from the health care industry. The second group may include hospital associations, physician societies, and specialty groups (e.g., radiologists, independent labs, etc.). It would not be practical or productive to use all these resources at one time. However, it may be useful for the various interest groups to establish a team that meets with state personnel regularly. The additional parties could serve as auxiliary members, attending only when their expertise is necessary.

It is important to develop both internal and external processes for decision-making. The internal process would obtain the necessary policy and technical input from affected agencies, use the agencies' considerable store of in-house knowledge, and inform government units of decisions that affect them. It is suggested that external process seek provider input only after

the internal process reaches a basic consensus. Difficult trade-offs can be presented to the external groups to allow for additional input and encourage constructive criticism from providers.

Having established the two groups, it will be useful to firmly establish the following three principles:

- the overall workplan with target dates is not negotiable;
- the state retains the authority for final decisions; and
- required state administrative procedures should always be followed.

Meetings should be scheduled regularly. All decisions should be properly documented. This will be much more difficult in practice than it appears. Under deadline pressure, decisions will be made in hallways and late at night. Situations will occur in which systems personnel will need to modify the program while testing tapes. It is essential that a procedure and format be established to document these changes. While these changes may be seemingly minor to the programmer, the documentation is critical to the process. Thus, someone must be given both responsibility and authority for this task.

The open format with predetermined parameters reduces the risk of problems in the future by allowing all participants to comment on the DRG program as it is created. These comments provide the state with an early warning system that identifies points of contention that may require additional negotiation.

Further, it becomes difficult for industry representatives to react harshly in the future if they neglected to respond when the issue was initially raised. Early resolution of problems is preferable because it will be far more difficult to change certain program characteristics after myriad other related policies are already established.

The ideal situation is to maintain an atmosphere of cooperation in resolving issues and solving problems. This is especially helpful when the state lacks specific data and requires an industry survey to obtain the information. Defining its needs and putting the burden of proof on the industry can help the state avoid imprecise data which might be utilized without this prior consultation.

Maintaining documentation and communication flow between groups becomes increasingly important as the actual implementation approaches. Such documentation may also become a defense if legal action is taken by a provider group or another affected party.

C. Establishment of an Integrated Work Plan

Implementing a DRG prospective payment system will require the coordinated actions of every component in the Medicaid department. It is critical that the major tasks for each component be identified and assigned, and that progress on each task be tracked. This process should allow for the additional tasks

that will be identified as the project progresses.

Many other factors may effect the implementation of a DRG system. These factors include:

- The availability of state staff to deal with problems at a moment's notice, given the time constraints of normal work activities;
- The ability or inability to establish a regular block of computer time for the DRG implementation team;
- Difficulty scheduling meetings with external providers;
- Difficulty retrieving information from existing files;
- Lag times in provider group responses;
- Legal ramifications concerning material, discussion, and documentation shared with the public and providers;
- Existing state regulations which may establish a legal format for implementation including public hearings or other requirements; and
- Potential legal action by a provider to prevent implementation of the system.

Appendix D contains the work plan developed by Pennsylvania. It is basically self explanatory. Other states could modify this plan to meet their needs.

D. Personnel Requirements

Proper staffing is critical to the development and implementation of the program. In addition, it is vital that a

core of state staff be created or identified to maintain the program after implementation. The experts responsible for the program must be credible to the health care industry. More important, the state must be able to use all of the new data necessary for analysis and rate construction, budget forecasting, impact analysis, access/quality of service, trend analysis, and recipient impact. The development and implementation of a DRG system will not necessarily eliminate state positions, but rather may redefine the scope of work for which individuals are responsible. Such redefinition will occur in the transition from implementation to ongoing operations.

This requires specific skills and experience. The actual staffing configuration needed in a given state will depend on a variety of factors. However, based on the experience of the states that have implemented DRG systems, a state will need to indicate the skills and staff resources that are described here in terms of six staff positions:

- hospital accountant;
- senior analyst programmer;
- statistician;
- hospital/health policy specialist;
- medical professional in medical coding and technology; and
- nurse involved in active utilization review.

1. Hospital Accountant

The development of payment rates under a DRG prospective system is a new science in the hospital industry. Because accounting principles are not applied consistently across hospitals, if a state has not had prior rate-setting regulations or strict cost report requirements (other than some variation of the Medicare cost report), providers may be able to manipulate data to their advantage. Certified cost reports or accounting statements are usually an acceptable document from which data can be abstracted. In the development of the rates for a DRG reimbursement system, it is necessary to go beneath the surface of these reports. Generally, a certified report is only an indication that proper accounting techniques have been used and that the numbers properly total. What is not included in the certification is the root source of the actual expenses and the allocation or definition of all expenses and revenues.

The state should try to ensure that there is some consistency in the allocation method between hospitals and that its definition of terms is consistent with industry usage. If, for example, hospitals have been depreciating similar items differently, it is essential to be able to make adjustments for these differences in order to establish a uniform rate base. Another example of this problem is the reallocation of certain costs to the out-patient area. Under Medicare prospective payment systems (PPS), there is little restriction on how this is

done. This allocation should be consistent among all federal and state reports to preclude cross allocation.

An accountant with current hospital experience (preferably a certified public accountant), should have the knowledge and expertise to evaluate the data submitted from hospitals and identify any irregularities. An intimate knowledge of the inner-workings of a hospital fiscal department is invaluable. Such an individual can initiate discussion and challenge reporting on various reports from Medicare, Medicaid, Blue Cross, and others, thus ensuring continuity in definition and a reduction in error rates. An experienced individual is also an asset in negotiations with the provider community.

2. Systems Analyst/Senior Programmer

At least one full-time systems analyst or senior programmer will be required to develop and implement the various computer models and produce the reports necessary to create the DRG relative values and prices. The individual must be able to understand the needs of both the statisticians and program policy personnel, and to incorporate these needs into the computer models and reports. Without this capability, the systems analyst/programmer will not be able to adequately respond to the needs and inquiries of the staff responsible for making policy decisions.

In designing this computer model, the specifications for the fiscal requirements, policy requirements, and simulation capabilities of the system must be determined. By its very nature as a simulation model, the computer models will be required to address many different aspects of the decision-making process concurrently. The specifications for the design of the computer models will be defined during the early internal meetings of the state representatives and the consultants to identify key areas of analysis. It is important that the systems analyst/programmer attend these meetings. Not only will the programmer better understand the requirements of the system that must be developed by viewing the decision-making process first hand, the programmer will also gain an invaluable perspective on why these requirements exist. This perspective will address the concrete fiscal, legal, and policy requirements of the state which accompany the development of a DRG system. By viewing these proceedings, the programmer will be better able to link the overall objectives of the computer models with the individuals and topics the models will need to address.

The primary responsibility of the systems analyst/programmer will be to develop two computer models. These models, which are described in more detail in Chapter 5, are:

- Simulation Model: The simulation model allows the policy analyst to evaluate the finanical consequences of alternate policy decisions for hospitals. The simulation model is a

computer representation of the payment system. It computes revenues and costs for each hospital in the state under a variety of assumptions. Therefore, the creation of such a model is essential to the policy development process. The programs which make up the model can produce various reports and listings which will illustrate the effects of various decisions. Comparative and/or descriptive statistics will make up the bulk of the output from these programs.

- Pricing Model: The pricing model will use the claims data, hospital cost report data, and calculated statistics available to the system to produce the actual DRG prices. This model is central to the financial objectives of the program and is also a focus of industry attention. Thus, accuracy of the programs which comprise this model is essential. In addition, many policy decisions will be imbedded in the pricing logic and certain data used in the pricing model may be provided by the simulation model (e.g., calculated statistics). In this way, the simulation model and the pricing model are interrelated. That is, to respond to a specific policy decision, changes to the simulation model may be required in order to provide the correct information to the pricing model.

Statistician. An individual with an extensive background in statistics is required to manipulate data in the development of relative values and the extrapolation of essential cost components. In most cases, all the data needed to establish a DRG reimbursement system will not be present. When this occurs, missing components will need to be constructed from available information.

If a state has selected a budget neutral position, the DRG prices must ensure equitable distribution of the available monies across the effected hospitals, without prejudice. As decisions are made on the treatment of certain reimbursement elements (e.g., major movable equipment), techniques will need to be developed to implement these decisions. Since these techniques must be defensible (and will be closely scrutinized), the statistician's credentials will lend credibility to the formulas. If this position is filled or supervised by an individual outside the state employment network, an air of objectivity may be created. As the types of data and necessary manipulations are discussed, the need for a recognized expert will become more apparent.

3. Hospital/Health Policy Specialist (HHPS)

This position requires an individual who is familiar with the health care industry as a whole, and who has a working knowledge of health care administration issues. The hospital health

policy specialist should be the coordinating factor for the entire effort. This person's central responsibility will be the continuing process of identifying and updating issues that affect the development and later the implementation of the DRG system. Industry reaction to specific decisions should be anticipated and a response prepared. The impact on other programs/providers should be evaluated and their needs addressed. This individual could mediate the needs of all parties by immediately establishing an external provider relations network, i.e., maintaining open lines of communication with provider groups and responding to their concerns or inquiries. Additional areas of involvement might include:

- preparation of internal and external training material;
- participation in the formulation of the utilization review protocol;
- analysis of data for case mix evaluation; and
- documentation of the development process and decision logic.

4. Medical Professional-Coding and Technology

This position will sample and review existing records to identify DRG assignment problems in the data base. For example, if the decision is made to exclude psychiatric cases from the system, someone must review the DRG decision logic and identify the diagnostic codes and/or DRGs that should be excluded. These

exclusions must then be backtracked to the data base of paid claims to identify all related claims. If this is not done properly, the dollar amount available for distribution (i.e., the budget for DRGs), could be under- or over-stated. Improper inclusion could also adversely effort the relative value calculations. As another example, a state might decide to consolidate a few DRGs into one because the claims volume in these groups did not provide statistically significant prices. To accomplish this, related diagnoses must be identified based on clinical similarity and code structure. The interaction of secondary diagnoses and procedures in the DRGs must be understood in order to apportion these cases to the new categories. While this function is important during the development process of the system, the medical coding expert will also be involved with developing the new utilization review protocol and will eventually assume DRG monitoring responsibilities.

5. Nurse

The development of the utilization review protocol required in a DRG environment will be enhanced if the staff possesses an understanding of hospital physician practice patterns. Many states and other payers employ a nurse with appropriate background for this function. Protocol development includes defining procedures that can be performed on an outpatient basis. Once these procedures are identified, the coding specialist can find

the corresponding claims in the data base and ensure that they are deleted from the inpatient cost calculation. Review mechanisms must also identify cases for review in the event an admission for this type of procedure occurs. Clinical criteria for the entire review process must be defined to ensure consistent application of Medicaid policy concerning medical necessity. Once the clinical criteria are established, they should be confirmed by the office of the medical director, helping to avoid future challenge to the review criteria by other physicians.

Chapter Five

Technical Issues for Computer Programming

A. Overview

The quality and accuracy of the data base is central to the success of any DRG system. The data base and computer software developed for a DRG system should have the capacity to:

- Analyze hospital cost and discharge data to calculate relative weights for each DRG and to create a case mix index. This allows this data to be grouped using various configurations, which is needed for analysis and policy development.
- Calculate rates for each DRG, incorporating specific sets of policy decisions.
- Develop a "what if" analysis of the impact of alternative policy decisions on individual DRG rates, on the distribution of payments across individual facilities, and on other relevant measures of the effect of the policy alternatives.

To accomplish this capacity, the following specific activities must be completed:

- Create an integrated data base using information obtained from hospital cost reports and Medicaid paid claims;
- Develop a computer-based pricing model to calculate DRG rates based upon a set of data policy decisions; and

- Develop a computer-based simulation model to analyze the impact of policy changes on DRG rates and other factors.

These activities and the tasks associated with each are discussed next.

B. Developing a Data Base

Implementing a prospective payment system requires the construction of a current and accurate data base. The data base will contain claims data, possibly for several years, and hospital cost reports for one year. The decision as to what data to collect should be determined early in the development process so that efforts to collect the data can begin. In deciding what data to collect, each of the separate tasks that the simulation and pricing models will be required to perform should be identified. For example, it must be known whether the state will compute its own relative weights or whether they will be obtained elsewhere. If the weights themselves are obtained elsewhere, claims data will still be needed for the various policy analyses. The different data elements required for each task are then identified. At a minimum, the data collected should contain all of the elements necessary to satisfy these identified tasks. An effort might also be made to anticipate possible esoteric questions that require data outside of the basic requirements of the

simulation model. The data should be edited and verified prior to use in the simulation model. This will save time in the long-term, because computer runs and analysis will not need to be repeated.

The DRG data base will be made up of information obtained from two sources: hospital cost reports and Medicaid claims files. The implementation of a DRG system depends upon the integrity of the data base used to set the rates, and requires a current and accurate data base. The key to the usefulness of the data base is uniformity of definition in the elements used for rate calculations. Care must be taken to verify the uniformity of terminology and the content of elements used in the data base. This applies especially to the hospital cost report data. For example, if one hospital combines major movable equipment expenses and capital expenses into one line item, while another hospital reports each cost separately, these items should be reconciled. A sufficient volume of claims data should be available for each DRG to produce statistically valid results. Several steps are required to create a DRG data base:

1. Selecting Sources and Contents for Hospital Financial Data

The simulation and pricing models will require the most recent cost report data available for each hospital. The data elements required for the simulation models should be identified as soon as possible so collection of the data can begin. It is

also desirable to seek provider advice about the most appropriate elements for measuring a particular item (e.g., expenses for movable equipment) and to help identify idiosyncracies in the data.

Audited hospital cost reports should be used when possible. Unaudited cost reports are more current and can also be used, but hospitals should be allowed to revise the report to reflect new information or changes when the cost report is audited. A listing could be mailed to each hospital for verification. In this way, an attempt is made to remove incorrect information from the cost reports. If certain statistics are not available in the cost reports, alternate sources such as federally mandated cost reports may be used to fill in the gaps. These data need to be checked for consistency and verified. Prediction equations and the simulation model will also be useful for this task.

The collection and preparation of the cost report data is a tedious task. Most cost reports are not in a machine-readable or automated format, and must be manually inspected for the appropriate data elements and manually keypunched into a machine-readable form. (In states that do not require a common cost report format, hospitals submit cost reports which are very different from one another. This further complicates the process of extracting the required information from the cost reports.) Special programs should be written to check the reasonableness of the data after it has been entered on the computer. Further, when

manual intervention is required to produce information in a standard format, steps should be taken to ensure accuracy. This can be accomplished through reabstracting a sample of the hard copy information and comparing it to the tape results.

2. Editing Hospital Financial Data

The hospital cost report data should be edited to ensure accuracy, as well as to test the appropriateness of the data for these new uses. Summary statistics can be generated from the claims data files. Since the cost reports are of the services the hospital performed over the year and the claims are a record of these services, there should be a relationship between the two files. Although some variance between the two files is expected, large variances can be identified and investigated through this process. This may involve requesting clarification from the hospital on the contents of the data element from which the statistic in question was drawn, e.g., the cost liability. If more than one cost report for the hospital is available, trend analysis tests can be performed. This test compares the previous year's special care unit per diem costs to this year's. It is important to verify the hospital cost file at this stage. Identifying errors later, when the data has been used by the models, will be much more difficult and time consuming.

An additional step in editing the data involves printing each hospital's statistics and forwarding a copy to the hospital for verification. The hospital would be instructed to verify the accuracy. This can be done either with selected hospitals or as a general solicitation by mail. The latter alternative should include a strict deadline for the hospitals, or the state will be unable to fulfill its work plan.

3. Selecting Content and Sources for Claims Data

The heart of the simulation and pricing models is the claims information. This detailed information will be the basis of all relative values and prices. The calculation of relative values will probably require several years of claims data in order to establish a sufficient number of cases within each DRG to develop statistically valid relative values. This multiyear data base will also allow trend analysis simulations to be performed. The pricing model will require only one year (the base year) of claims data. For consistency, all claims should be standardized to the base year.

The claims data elements required for the simulation models should be identified by the hospital accountant as soon as possible so collection of the data can begin. At this time, any other data elements that the state may wish to collect should be

identified. The simulation model will be able to support many other research tasks. It should be viewed as a research tool that has utility beyond its primary purpose of calculating DRG prices. These other research tasks should be carefully considered when requesting the data elements for the DRG system. It is very difficult, if not impossible, to gather additional data elements after the files for the simulation model have been created.

The collection of data has proven to be a time-consuming task. Special programs must be written to access the correct files within the state computer system. Staff must be allocated to the task, detailed program specifications produced and approved, codes written and tested, and finally, the necessary files created. Since many state computer centers have limited programming resources, this task may be further delayed.

It is also extremely important to attempt to "get it right the first time." Errors within the claims files, which may require recreating the files, might not be identified until weeks or months after the files were first created. Verifying the accuracy and appropriateness of the source of the information and the method used to extract it from state files can avoid a potentially disastrous situation.

Verifying the claims file is not easy. However, general edits can be performed. Using statistics from hospital cost reports, summarize the claims information for the base year for

data elements (total costs, total charges, total claims, total days of care, etc.) and compare the result with the cost report value. Thresholds should be established and variances beyond this threshold investigated.

4. Editing Claims Data

Before the claims data can be used in the models, certain tasks must be performed to prepare the data. The most obvious, and cumbersome, task is editing the claims to identify erroneous or incorrect data. Due to the size of claims files and the nature of these data, this editing is very time consuming. However, using the hospital data as a base, summary statistics from the hospital cost reports can be estimated using the claims data. Wide variances can be identified and in-depth investigations can be made on an exception basis. (Note that the claims data can identify errors in hospital cost data as well.) Descriptive statistics by variable can also be used to check the accuracy of the data. Most statistical packages provide a means of reporting the mean value, minimum value, and maximum value of a data element across all records in a file. This type of analysis will identify the obviously incorrect entries within a variable (i.e., a maximum value of 678 when the mean value for the file is 25). Incorrect entries should be removed or corrected as possible.

After the claims data has been edited, the claims may require reformatting. Due to the size of the claims files, it is necessary to reduce the size of the files used in the models as much as possible to speed the execution of programs. Therefore, if a data element is reported in a field with a length of four characters and it is known that this data element has a maximum value of only three characters, then the unnecessary character should be stripped from the file. Any data elements that may be aggregated or combined into a single data element, without losing the significance of reporting them separately, should be combined into a single data element. Finally, any data elements that were requested on the original files that are not essential to the DRG efforts or any other research efforts should not be included in the file used by the models. These steps will provide a smaller, more easily handled file that will still meet the state's research requirements.

It may also be necessary to add data elements to the claims before they are used by the models. The most obvious data element that is added to each claim is a DRG value. Most states do not currently assign a DRG value to their claims. Further, the claims processing system will probably not be modified to assign a DRG to claims until after the research files have been created for analysis. Therefore, a grouper program should be purchased to assign a DRG value to every claim to be used in the models. The method used to calculate DRG rates may group the hospitals

into peer groups based upon the values of certain data elements. The group to which the hospital is assigned would also be assigned to every claim in the data base for that hospital. The standard grouper requires IBM equipment. Another type of computer may require a specialized grouper program.

The DRG system contains separate DRGs for a mother and her child, even if the delivery was normal. However, current Medicaid invoices for a routine delivery in which the mother and child are in the hospital together do not separate costs between the two. This is because the new baby will not have a Medicaid identification number and would not need such a number unless a problem develops. Therefore, it is not possible to price separately the DRG associated with the mother's stay and the DRG associated with the infant. Where an infant remains in the hospital after the mother's discharge, a separate admission (and invoice) is recorded to cover services provided the infant during the remainder of his/her stay. In addition, an infant may die or be transferred to another institution before the mother's discharge.

In order to calculate prices for newborn infants (MDC 15-DRGs 385 through 391) accurately, hospitals would need to provide revised invoices for all deliveries, segregating services provided to the mother from those provided to the infant. This requirement would be very expensive for the hospitals and would result in delays which would jeopardize the timely calculation of

DRG prices. Therefore, this is not considered to be an option.

More relevant options include:

- Estimating the costs of care for DRGs 391 and 385; prices can be computed for these DRGs based on the mother's length of stay and by assuming that services not provided in a neonatal unit are provided to the mother; or
- Combining those infant discharges in the data base which were grouped into DRGs 391 and 385 with the mother's discharge and calculate prices for delivery DRGs, which include the costs associated with both the mother and infant.

Paid claims data includes the provider's charges for performing the services. State Medicaid programs reimburse the provider on what it costs to perform the services. A provider may charge $25 for a pint of blood, when the blood actually cost only $15. Therefore, each of the charges listed on the claims may be converted to the actual cost of providing the service. This is a very detailed process, as data collected from the hospital's cost report must be utilized to compute charge-to-cost ratios for each identifiable ancillary cost center within the hospital. Per diem rates for each bed type must also be determined. To compute a total cost for a claim, each ancillary and bed charge identified on the claim must be converted to its cost and the results added to arrive at the total cost of the claim. This statistic will be the basis of most of the analysis within

the models. Every effort should be made to verify the accuracy of the hospital's information and to verify that the method used to apply the ratios is appropriate. Matching data elements with cost reports and claims data will require assumptions that these should be documented.

If the charge data needed to arrive at the total cost of the claim is not required for any other reason, it could be excluded from the final claims files used by the models. This would shorten the files. The claims data is now ready to be used by the models for DRG analysis.

5. Obtaining Data to Fill Voids

In some instances, a state will not have had enough clinical experience in certain DRG categories to calculate a statistically valid relative value or price for a DRG. Also, certain hospitals may be unable to report certain data elements or they may report completely useless data. In either of these cases, the state must decide how to fill these voids. Claims data can be augmented from other years or from claims from another payer. Medicare or another state's relative values might be substituted for a statistically invalid relative value.

Any of these alternatives could fill the voids. However, the impact of using alternative data sources should be considered. Medicare, for instance, is a particularly inappropriate source of

substitute data for Medicaid data. The populations of these programs have little in common, and the results may be counter to the state's objectives.

6. Choosing the Computer for the Job

Any medium to large mainframe computer can accomplish the necessary data processing tasks associated with developing DRG rates. However, depending upon the size of the historical files used, and the number of hospitals within the state, the data base developed could be very large. To calculate a single statistic could require hundreds of thousands of claims to be read. Therefore, the computer used to develop the simulation and pricing models should have sufficient capacity to process large numbers of records in a reasonably timely manner. Programs that require two or more hours to execute are not conducive to the fast decision-making environment that will accompany this project. The choice of software in which to write these programs is also a decision that should be made carefully. A software package that cannot easily produce statistics should be avoided. A package with built-in statistical procedures such as SAS or SPSS may be more appropriate, than would COBOL or PASCAL, where custom programs would need to be written. The choice of software also depends in part upon the hardware that is being used. If the software package requires the use of a large amount of computer memory (SAS is an example), then some smaller computers would be

hardpressed to run large jobs for the simulation and pricing models. Obviously, extensive input/output operations will be performed. Therefore, it is also important that the package chosen has efficient input/output routines built-in to optimize the transfer of data in to and out of memory or between storage media.

C. Developing a Pricing Model

The pricing model is composed of a series of computer programs that manipulate the data within the data bases to generate DRG prices. The pricing model and the simulation model are closely linked, since the pricing model can also be used as an important simulation tool in testing alternative pricing methods. The pricing model also utilizes much of the data that the simulation model will develop. Developing the pricing model should begin as soon as possible. However, since the larger simulation model affects the pricing model in a variety of ways, the pricing model should be loosely designed until the simulation model has been largely conceptualized and designed. This will avoid the time-consuming task of reprogramming sections of the pricing model due to changes in the source or structure of data provided by the simulation model. The pricing model is central to the financial objectives of the program and is the focus of industry attention. Therefore, every effort should be made to ensure the accuracy of the programs which constitute the pricing model.

D. Developing a Simulation Model

The simulation model is a series of programs which translate policy decisions into computer code. In general, the simulation model manipulates the data base to produce descriptive statistics, and/or reports that will test various policy decisions. That is, the model will be able to address the different scenarios and data needs that will be required in the policy development process. This model is essential to the policy development process because it will allow the policy analyst to evaluate the financial impact of alternative policy decisions. In addition, the model will allow easy identification of policy decisions that have unintended adverse impacts. For example, using a routine which arithmetically, as opposed to geometrically, derives outlier trim values will result in very high high-end trim values for some DRGs and negative low-end trim values for most DRGs. As another example, assume that trim points were calculated as plus or minus three standard deviations from the mean for a DRG to identify claims with aberrant cost amounts. If an alternative is to use two standard deviations, the effect of this approach could be simulated. A higher number of claims would be "trimmed" by the smaller trim point. Thus, fewer records would be available to calculate of statistics. This will have an undetermined effect upon the statistics calculated from the "untrimmed" claims. The simulation model would be able to easily illustrate the effect of this alternate method of

assigning trim points. The simulation model will also provide various statistics to the pricing model to be used in creation of the DRG prices.

The output from the programs which make up the pricing model will be various descriptive and calculated statistics which are passed to other programs in the pricing model. Also, the results of these programs will be documented by producing reports which summarize the values calculated. The final result will be a report and/or a computer file containing the prices for each DRG. It is highly recommended that reports be produced at each decision step in the process for documentation. If a statistic is calculated and passed to another program, then the statistic and all values which were used in the calculation should be printed. If unexpected or unreasonable results occur in a later step, these reports can be scrutinized to determine the possible source of the problem. They can also be used to double check the accuracy of the algorithms which may make up the calculation.

It is wise to begin development of the simulation model as soon as possible. This task can be simplified somewhat by beginning with a simple simulation model and adding refinements over time. This will aid in the debugging of program logic and codes, and the identification of errors or anomalies within the data base used in the simulations.

E. Analyzing the Data Base

The DRG data base developed by the state will be manipulated through the simulation and pricing models in a variety of ways to arrive at the DRG relative values and rates. The following discussion addresses the tasks the models should be capable of performing.

1. Hospital Cost Report Data

Hospital cost report data will be used by the DRG models in a variety of ways to help calculate DRG rates. Tasks the hospital cost report might be used for include:

- Determining the attributes of each hospital so it can be assigned to a peer group;
- Converting the charges reported on the claims to actual costs incurred by the hospital;
- Computing an average cost per case for the hospital, which will be used calculate the peer group cost per case, statewide cost per case, and DRG rates;
- Computing exclusion costs for a hospital. These exclusion costs are monies that will be paid to the hospital outside of the DRG rate, but that are included in the cost of providing services (i.e., depreciation and interest on

capital expenses, hospital-based physician expenses, etc.). These costs must be identified and subtracted in computing the average cost per discharge; and

- Identifying costs that are to be excluded from the DRG system. These costs may include a specific category of service, such as psychiatric or drug treatments, that do not follow the same treatment patterns as other DRGs.

Many other tasks will be required of hospital cost report data that are not directly related to a larger task. These generally involve clarification of certain topics. For example, a query may be made as to the number of claims and costs generated by hospitals with psychiatric wings that are separately administered. The fact that a hospital has a separately administered psychiatric wing would be recorded in the hospital cost report file. The data to answer the query would be gathered from the claims files for the identified hospitals.

2. Claims Data

The data obtained from the Medicaid claims file will be used in the models for two purposes: first, to calculate the statistics necessary for assigning DRG relative values and rates, and, second, to report on a topic of interest that will aid the policy-making process by illustrating the current status of the project. In addition, the claims data might also be used to support other research efforts.

DRG Analysis. After the preprocessing tasks have been completed, the claims data is ready to be used by the DRG models. The major tasks claims files will perform are:

- Computing relative values for each of the DRGs. This is done by comparing the average cost of all claims for a DRG to the average costs of all claims in all DRGs and reporting the ratio. The geometric means is used for this calculation (see Chapter 2).
- Calculating a case-mix index for each hospital based upon the relative values. The case-mix index is calculated by multiplying the proportion of cases a hospital has in a DRG by the relative value for the DRG. The result across all DRGs is the hospital's case-mix index, which is a measure of the intensity of service or resource consumption for a provider. The case-mix index is the average relative weight for a hospital.
- Computing exclusion costs for a hospital. These costs must be identified and subtracted in computing the average cost per discharge (see discussion under hospital cost report data).
- Determining the total costs and the total number of claims for a hospital.

  as other DRGs.

- Developing an aggregate DRG reimbursement for a hospital based upon the computed rates and a hospital's case-mix index.

If rate structures are computed by peer group, it will be necessary to adjust (divide) each hospital's cost to account for its Medicaid case mix. In computing the prospective rate levels, hospital-specific cost data is used. These data include the cost effects of each hospital's Medicaid case mix. If the hospital's costs within a hospital group are simply averaged, this average will include the case mix of each hospital group (for example, the average cost of a high-cost case mix). If this average (which already includes high-cost case mix) is multiplied by the DRG's relative values to derive prices, then the number of cases in each high-cost category is multiplied by the above prices (in effect, adjusting payment for the high-cost case mix), the group's average case mix would have been included in its total revenue twice. This problem may be avoided by dividing each hospital's average cost per Medicaid case by a Medicaid case-mix index. A hospital's case-mix index is simply the hospital's average of the relative values weighted by number of cases divided by the statewide average of relative values weighted by numbers of cases. This produces an index in which a hospital that treats an average Medicaid case load will have an index value equal to one. A hospital with a more difficult case load will have an index greater than one. When a hospital's cost per

case is divided by its case mix index (CMI), the result is the hospital's cost as if it treated an average case mix load instead of a high-cost case mix. These "as if" costs, averaged within a group, will produce an appropriate price level, that is, a price if the group's case mix was exactly average. Thus, when the effect of the high-cost case mix is reintroduced, (i.e., when the price level is multiplied by relative values times cases in each DRG) the high cost of the group's case mix will not be counted twice.

If the Medicaid program grouped hospitals by location and adjusted the rates using an area-wide index, a similar procedure also would be necessary. Groups based on teaching status combined with a separate rate adjustment for teaching would also require adjustment to avoid double counting. These could include:

- Comparing payments under the DRG system to payments that would have been made under the old system to simulate the impact of the DRG system on each hospital, or
- Testing and implementing budget neutrality scenarios to adjust rates to meet a specific spending target.

In some instances, a series of small tasks may be necessary to prepare statistics for a larger task. The claim file should be able to support all types of analysis.

Other Analysis. Not all tasks will be directly related to the calculation of DRG relative values and rates. Many topics

that will interest policy makers will be found on a subset of the claims data base. For instance, to decide how to reimburse nonapproved drug and alcohol treatment centers that treat drug and alcohol cases, the first step might be to determine the amount of current expenditures. The claims data base should be flexible enough to respond to these ad hoc inquiries in support of the DRG policy-making process. Other tasks that support ancillary topics not related to DRGs will also be performed using the claims data base.

Together, the hospital cost report data base and the claims data base form a very useful and valuable source of information concerning the state's Medicaid program. The structure of the data bases should be designed to meet the needs of a large audience of analysts as well as the DRG policy makers.

Chapter Six

Support Systems: Claims Processing, Utilization Review, and Provider Relations

A. Introduction

Successful implementation and operation of the DRG reimbursement system will likely require changes in at least four related areas of Medicaid program administration. These are:

- claims processing,
- utilization review,
- provider relations, and
- post-implementation monitoring and review.

This chapter gives a brief overview of issues raised by the DRG system relevant to these four functions.

B. Claims Processing

The claims processing section of the Medicaid agency or its fiscal agent must to be able to process DRG claims shortly after the implementation of the system. This date may be somewhat flexible due to program payment policy decisions. (Normally in a DRG environment, a state will only pay after the patient is discharged, with the possible exception of interim payments for long-stay outliers.) The claims processing area must also implement policy decisions regarding any special payments (e.g., outliers or transfers), and additional payments (e.g., capital and

medical education), in addition to the normal DRG payment. Further, it is desirable to incorporate a set of front-end edits for diagnosis and procedure coding before the grouper program assigns DRGs. Some of the system edits will probably need to be modified. These tasks are somewhat more complex than they might initially appear. Therefore it is important that the unit responsible for this function participate in the development of work plans and schedules.

C. Utilization Review Design

Under flat-rate prospective payment, the focus of utilization review must shift from length-of-stay review to admission, readmission, and transfer monitoring and control. If the payment system itself is correctly designed, review of outliers will be less critical than review of admissions. Outlier payments should be enough to stop the financial loss, but not enough to convert it to a gain. This will assure the hospital will have no incentive to hold cases until outlier status is reached. The basic utilization review policies should be in place before the implementation date. However, policies can be changed and strengthened after the system is implemented.

Because a hospital is paid the same amount for a patient regardless of length of stay, it is less important to be aware of how long a patient stays in a hospital than to be certain the admission was needed in the first place. Thus, transfers and

readmissions may be of increased concern to the utilization review staff. Further, quality of care may become an issue, as the DRG system (like any per admission prospective payment system) provides the hospital with incentives to discharge the patient at the earliest date.

The last section of this chapter also reviews operational constructions for utilization review.

The utilization review program is intended to determine whether services are medically necessary, are furnished at the appropriate level of care, and are of a quality that meets professionally recognized standards. In addition, under DRGs diagnosis coding is verified, DRG assignment is confirmed, and billing procedures are reviewed. The overall purposes of these activities are:

- To assure that the care delivered to all Medicaid patients in acute care hospitals is appropriate and of a quality that meets professionally recognized standards of health care;
- To assess and document the need for diagnostic and/or therapeutic services that can be best provided in an inpatient acute care facility;
- To ensure that the items and services that are rendered are reasonable, necessary, and consistent with the recipient's diagnosis; and

- To identify and correct statewide provider and/or practitioner problems (out-of-state high-volume providers may also be included).

Before a utilization system can be properly constructed, five major decisions must be made. These decisions become the focal point for the design and implementation of a system. A decision support framework matrix is presented in Table 6.1. The major management alternatives are displayed on the horizontal axis:

- review process;
- concurrent versus retrospective review;
- staffing;
- state operated versus contracted;
- hospital authority;
- delegated versus non-delegated; and
- location (on-site versus central location).

The vertical axis represents the various types of review that a state may want to consider in the design and development of a DRG utilization review/quality assurance system. These topics include: preadmission review, admission review, outlier review for both length-of-stay and cost, DRG verification, patient transfers both pre- and/or post-transfer, readmissions, and quality assurance. This listing is by no means complete because the topics will vary by state, but it does incorporate

Table 6.1 -- DECISION SUPPORT FRAMEWORK

	MANAGEMENT ALTERNATIVES							
	REVIEW PROCESS		LABOR (STAFFING)		HOSPITAL AUTHORITY		LOCATION	
AREAS FOR REVIEW	CONCURRENT	RETROSPECTIVE	STATE EMPLOYEE	CONTRACT	DELEGATED	NON-DELEGATED	ON SITE	CENTRAL OFFICE
Preadmission	0							
Admission								
Outlier Review								
-Day								
-Cost						0		
DGR Verification		0				0		
Transferred Patients								
-Pre	0							
-Post		0						
DRG 468		0				0		
Readmissions (7-14 days)		0						
Quality Assurance		0						

**Note: By definition, "0" indicates that no other alternative is practical

the essential elements to be considered. Combinations that are necessary are indicated by a zero in the appropriate table cell. For example, the "0" indicates that if the state elects to do preadmission review, it must do so prospectively. Retrospective preadmission review is a contradiction in terms.

The evaluation of management alternatives should involve independent consideration of each of the topics on the vertical axis. After initial consideration, it is appropriate to review these alternatives in relationship to each other. Thus, upon re-review, it may become apparent that design modifications are needed to make the decisions consistent. As a practical matter, some of the decisions have already been made by virtue of the definition of the review activity. For example, DRG verification can only be done on a retrospective basis and can not be delegated to a hospital since the hospital's own accuracy is being reviewed.

1. Preadmission Review - The Hospital or the State?

The preadmission review need not be an elaborate exchange of documentation, but rather can be a telephone call to a central authority. Admission approval can be confirmed through the use of sequential authorization numbers. A preadmission review process should incorporate the necessary safeguards to preclude instances in which admissions for life-threatening conditions might be mistakenly denied. The consequences of such an action

could be the loss of a life. Therefore, any admission that is deemed to be an emergency should be authorized automatically. For non-emergency elective surgical procedures, if authorization is denied, the hospital is denied payment but could still admit the patient. In this case, a retrospective appeal process would be appropriate. Finally, if a hospital is responsibile for preadmission authorization, and it does not follow procedures, the hospital, not the patient, bears the burden. For this reason, hospitals prefer that Medicaid pre-certify patients for admission. The Medicaid program has little to gain from this option, and much to lose.

2. Concurrent Versus Retrospective Review

The two alternatives for the overall structure of utilization review are concurrent review or retrospective review. Of course, programs can be designed to base the timing of review on the DRG category to be studied.

A concurrent review process typically allows for review of medical information prior to the discharge of a patient and certainly prior to the submission of a claim form. This method is preferred by hospitals because it permits a better estimate of actual cash flow and patient liability. In the event there is a denial of service, hospitals can address the issue with the

patient before discharge. A concurrent denial also allows the hospital to press for a rapid discharge, thus limiting their liability. The system itself tends to be labor intensive.

The alternative is a retrospective system in which the assessment of medical necessity, appropriateness of site of service and other factors is conducted after discharge and after billing. This method creates billing and adjustment problems for both the hospital and state agency, but it does not require the intense labor investment of a concurrent system. A retrospective system provides the state with additional advantage of not being constrained by a deadline in which the review must be completed in order for the hospital to bill. The hospital has the advantage of cash flow during the retrospective process, but it is at risk for any inappropriate claims.

3. State Employees Versus Contract Out

Whether or not a state wants to directly administer the utilization review function might be based on experience with the method currently used for utilization review and on the relative cost-effectiveness of alternatives available to the state. The state can qualify for a 75 percent federal match on utilization review dollars if the state contracts with the Medicare-designated professional review organization (PRO).

Further, certain aspects of Medicaid's survey and certification requirements can be deemed met when the professional review organization is involved, thus eliminating several additional functions that would otherwise be required of the state.

The Peer Review Improvement Act of 1982 also requires the professional review organization to accept a reasonable contract with a state if offered. The regional offices may intervene if a professional review organization fails to execute a reasonable contract. Nothing precludes a state from contracting with any other entity for the purpose of review. However, the federal match is reduced and deeming status is revoked.

Alternatively, a state may already have in place the proper staffing to conduct review and therefore not require assistance from an outside group. If a state elects not to contract out with a PRO, the state staff may be eligible for 75 percent match if the staff qualify as medical professionals. The state then must verify that their staff meets the definition of medical professional.

4. Delegated Versus Non-Delegated Review

If a state decides not to contract with a professional review organization, the third decision that will effect the review program design is whether a hospital will be allowed to review on behalf of the state or if the state will assume the total function without hospital intervention. In the past it was

not unusual for a hospital to participate in the utilization review function until it was documented that their performance was not adequate. The state always reserved the right to make the final determination. An appropriate role for the hospital under DRGs is to continue quality review and analysis. A hospital should not be involved in cost outlier review, DRG verification, or review of cases in DRG 468. Some observers have questioned the appropriateness of government delegating to hospitals responsibility for reviewing their own use of public resources. Medicare no longer allows final medical necessity decisions to be delegated to hospitals. However, federal statute does not preclude Medicaid from delegating such review to hospitals for its patients.

5. On-Site Versus Central Location

The final decision concerns the logistics of the review process. Will the review be done at the hospital or will the state require to hospital to submit medical records to a central location for adjudication? Submitting records is cumbersome and costly. However, geography and volume of work may be such that this is the most efficient method. After completing the decision support framework matrix (Figure 6.1), a state may determine that some forms of review are best accomplished at the hospital site

and other forms of review can be adequately completed at a central location. Alternatively, on-site review may be suitable for some high-volume providers (perhaps in large cities), while other hospitals may submit records to a central location.

State decisions on these issues will effect the type of system to be developed. In reviewing the various systems in states that use DRG payment systems and the basic method required by PROs for Title XVIII review, the following common components have been identified.

- Hospitals are excluded from participation in the review process system and, at most, may offer an opinion.
- Review is conducted retrospectively after claims have been submitted. The exception is prior approval for outlier payments based on medical necessity.
- On-site review is most common, precluding the need for chart submission.

States seem to be split evenly between having staff conduct reviews and contracting with the PRO.

To further illustrate the decision matrix, Table 6.2 presents the results of using this matrix in a hypothetical state. The system design selected by this state is:

- Preadmission review will be done on a concurrent basis by the state, without hospital involvement at a central location.

- Admission review will be done concurrently under contract with a PRO on-site without hospital delegation.
- Outlier review for day outliers (high trim points) will be done concurrently under contract with a PRO, on-site without hospital delegation.
- DRG verification will be done retrospectively, on-site under contract with a professional review organization (PRO).
- Transferred patients will be reviewed on-site prior to transfer under contract with a professional review organization (PRO).

D. Provider Relations

The extent of provider relation activities will be determined by a range of factors within a state. The purpose of provider relations with respect to the DRG system is threefold. First, it is useful to explain the rationale behind the system's design. This may mitigate negative reaction on the part of providers. Second, providers will find some of the data used to create the prices will also help in their own planning and decision making. Third, providers will need to be informed about billing and cost-reporting requirements under DRGs.

To promote good provider relations, it may be helpful to:

- Set up a newsletter to keep provider groups abreast of the system, or provide some mechanism for public notification of changes.
- Hold public meetings around the state with providers to explain and answer questions about the system. A toll-free telephone number might also be useful.

E. Post-Implementation Monitoring and Review

The work doesn't end after the DRG system has been implemented. There are three levels involved in monitoring a DRG-based hospital reimbursement system. They are: case-level reviews, DRG validation, and quality of care.

1. Case Level Reviews

It is not cost-effective to review every case that is admitted. Therefore, statistical analyses should identify diagnoses and procedures that are most probably aberrant. In addition, all cases that result in additional payment to the hospital should be identified for possible review. These might include:

- o Procedures that could safely be performed in an ambulatory setting or on an outpatient basis;

- Selected DRGs for specific hospitals where a short length-of-stay indicates that admission to an acute care facility may be inappropriate;
- Readmissions within seven to fourteen days;
- Transfer from any hospital to another hospital when either is reimbursed under the DRG system; and
- Patients with a principal diagnosis not usually indicative of a justified admission.

In addition, all outlier cases should be reviewed. These cases are not typical in nature because of the length of stay or cost of the case.

2. DRG Validation

For DRG validation, case data should be studied for pattern shifts between DRGs. For example, cases often are coded to the next higher priced DRG. This might be due to improved coding and understanding of the diagnosis coding system, or because of inappropriate abstracting from the medical records. Therefore, a random sample of all cases should be subjected to reabstracting from the medical records to ensure that the proper DRG was assigned, based on the end procedures in the medical record.

3. Quality of Care

DRG prospective payment, like many incentive payment systems, also provides incentives to lower the quality of care. There are

powerful countervailing forces which can act to ensure quality. These include the professional standards of health care providers, the fact that physicians are not directly affected by DRG payment, and the threat of malpractice suits. However, it seems advisable to use the utilization review mechanism for one of its original purposes - quality assurance. The focus here is really the institution. Certain cases might be target for review such as:

- deaths,
- same-day admissions or discharges,
- patients discharging themselves against medical advice, and
- readmission within fourteen days.

Reports for DRG Analysis Following are brief outlines of reports and profiles which could be used to meet reporting needs and provide for problem identification, monitoring, tracking, and impact analysis. Of course, any of these reports could (and should) be modified to suit a particular state's needs.

- DRG LOS and Cost Per Case Comparison, by Hospital, by Group

  Purpose: Compare differences from statewide norms of costs and length of stay.

  Variation: Aggregated by physician.

  Frequency: Quarterly

- DRG Pre-operative and Post-operative Cost Per Case by Hospital

  Purpose: Compare costs by pre-operative and post-operative stays within a DRG.

  Variation: Aggregated by physician; aggregated areawide by group.

  Frequency: Quarterly and Annually

- DRG Physician Profile with Hospital and Areawide Totals

  Purpose: Compare each physician's statistics to hospital and areawide totals.

- LOS Distribution of Elective Patients with Same Day Surgery Procedures

  Purpose: Assess the impact of outlined same-day surgery procedures in reducing inpatient length of stay. This report can also be DRG specific.

  Frequency: Quarterly

- Listing of Patients Discharged, Then Readmitted the Same Day with Hospital Totals

  Purpose: Identify potential problem areas due to early discharge of patients.

  Frequency: Quarterly

- Listing of All Complication/Co-morbidity Diagnosis Codes by Hospital

  Purpose: Verify discrepancies in the assignment of complication/co-morbidity DRGs.

  Frequency: Annually

- DRG Cost Per Case Comparison with Standard Values

  Purpose: Determine those DRG source of payment combinations, within each hospital, for which the cost per case is significantly different than the Medicaid price.

  Frequency: Annually

- DRG Mortality Rate Comparison with Areawide Expected Values

  Purpose: Determinate problems within hospitals with regard to mortality rates.

  Frequency: Annually

- High Outliers by DRG by Hospital and by Group

  Purpose: Determine those DRGs with more than the number of expected high outliers within each hospital for each DRG combination.

  Frequency: Quarterly

- Areawide Trim Point Verification

  Purpose: a) Problem Determination - Using data from the last available complete year (base year), show whether the present high trim points for each DRG were valid for hospitals as a whole; if not, what would be an appropriate increase or decrease to the value of the present high trim

point(s) for the DRG such that the new value(s) for the trim point(s) would reflect the percentile values of the presently established trim point(s).

b) Impact Analysis - Using the data from the impact year, determine if the number of high outliers areawide, within each DRG, is significantly different from the number expected for presently established trim points, ancillary-intensive/potential negative operating margin and potential diagnostic admissions.

Frequency: Annually

A variety of additional reports should be developed specifically for the utilization process. These reports may be configured in a variety of ways. The following data elements are needed to develop reports that enable effective analysis:

- For reports that focuses on diagnosis (or DRG) by hospital:
  - Number of patients,
  - Average acute length of stay,
  - Average total length of stay,
  - Total number of acute days,
  - Total length of stay,
  - Total number of utilization reviews reviews,
  - Total number of utilization reviews denials (full/partial),
  - Number of patients with skilled nursing facility days,
  - Total number of skilled nursing facility days,

- Average number of skilled nursing facility days, (skilled nursing facility day/skilled nursing facility patients),
- Number of patients with intermediate care facility days,
- Total number of intermediate care facility days, and
- Average number of intermediate care facility days, (intermediate care facility day/intermediate care facility patients).

- For reports that focus on procedures by hospital:
  - Number of patients
  - Number of patients with pre-admission testing (if applicable),
  - Total number of pre-operative days,
  - Total number of post-operative days,
  - Average number of pre-operative days,
  - Average number of post-operative days,
  - Average acute length of stay,
  - Average total length of stay,
  - Total number of acute days,
  - Total length of stay,
  - Number of patients with skilled nursing facility days,
  - Number of patients with skilled nursing facility days,
  - Total number of skilled nursing facility days,

- Average number of skilled nursing facility days (total skilled nursing facility day/skilled nursing facility,
- Average total length of stay,
- Total number of acute days,
- Total length of stay,
- Total number of utilization reviews reviews,
- Total number of utilization reviews denials (full/partial),
- Number of patients with skilled nursing facility days,
- Total number of skilled nursing facility days,
- Average number of skilled nursing facility days, (skilled nursing facility day/skilled nursing facility patients),
- Number of patients with intermediate care facility days, and
- Average number of intermediate care facility days, (intermediate care facility day/intermediate care facility patients).

• For reports that focus on procedures by hospital:

- Number of patients,
- Number of patients with pre-admission testing (if applicable),
- Total number of pre-operative days,
- Total number of post-operative days,

- Average number of post-operative days,
- Average number of pre-op days,
- Average acute length of stay,
- Average total length of stay,
- Total number of acute days,
- Total length of stay,
- Number of patients with skilled nursing facility days,
- Total number of skilled nursing facility days,
- Average number of skilled nursing facility days (total skilled nursing facility day/skilled nursing facility), and
- Average length of stay for all patients.

Three specific issues which should be analyzed in the monitoring process are identification of possible coding/sequencing variations, validation of clinician's conclusions (M.D. peer review), and review of ancilliary-intensive/high-cost admissions.

Several quality-of-care objectives should be defined with specific reference to each state's experience. Broad topics of concern should include:

- Identifying unnecessary hospital readmissions resulting from substandard care provided during the prior admission;
- Assuring the provision of medical services which, when not performed, have a significant potential for causing serious patient complications; and
- Identifying avoidable post-operative or other complications.

In summary, the utilization review function and monitoring activities combined with a properly structured data base form the nucleus for ongoing program evaluation. Data generated from utilization review systems might also be used in rate recalibrations and in designing other Medicaid cost-containment policies.

Chapter Seven

Future Directions for Medicaid DRG Prospective Payment

A. Introduction

This chapter is concerned with the future directions for DRG prospective payment for Medicaid. The principal components of a DRG prospective payment system are the case classifications (the DRGs), the DRG relative weights, and the DRG prices. These components are a useful framework for organizing the following discussion of future directions.

B. Classification of Cases

In analyzing future directions for case-type categories it is useful to consider short-term components in the DRGs, possible replacements for DRGs, and long-term directions.

Short-term Improvements. DRGs were developed over a period of several years and represent the state of the art in case-type categorization today. However, DRGs should not be thought of as a static system. Currently, the federal government has a contract with Health Systems International (HSI) of New Haven, Connecticut, to update and maintain the current DRGs. HSI maintains a list of everyone who has received a grouper program. The company also provides a mechanism whereby problems individuals have encountered with the current DRGs are logged. About once a year, a panel of HSI, federal, and state DRG people meet to

review these problems and correct the DRGs. This also updates the DRGs for technical changes in the practice of Medicine. States that decide to use DRGs may wish to become involved in this process. In any event, a new version of the DRG grouper program will be released yearly by HSI. The new version will contain all of the corrections agreed to by the panel.

DRG Replacements. Beyond minor revisions of the current DRGs, it is possible to infer the general directions toward which the DRGs might evolve. The numbers of medical codes from the International Classification of Disease system (ICD9-CM) that are considered acceptable for DRG assignment probably will be restricted and vague codes will be eliminated to limit diagnosis up-coding. It is hoped that more DRGs will not be created, but this may happen with DRGs, just as it has with previous medical and procedural coding systems. Some new DRGs may be based on specific new medical technologies.

As a more remote possibility, certain DRGs may require specific results on certain tests. Finally, it should be noted that DRGs do not consider certain dimensions of health care that influence treatment costs, such as the patient's social and economic condition, psychological factors, treatment goals, stage of treatment, multiple treatments during a simple admission, and similar factors. It will be difficult to include the multiple

dimension needed to describe a single patient in the current DRG structure. Some of these problems may be handled in the short term through facility-specific adjustments. In the long term, other grouping approaches may be required.

There are several alternative case-type classifications that might replace DRGs in the near term, or one of these systems might be used in combination with DRGs to provide a more refined classification tool. Designing a classification system is an expensive, time-consuming process. This is not a project that should be undertaken by a state agency. Therefore, information regarding these alternative classification systems is provided in Appendix A.

Modifications that Increase Inclusiveness. DRGs are a step in the direction of capitation payment. That is, DRGs "bundle" inpatient hospital services into a single payment unit. It seems reasonable, therefore, to assume that costs (e.g., capital) that are currently excluded from DRG payment ultimately will be included. Categories may also be created for excluded units, although this is more difficult than may first appear.

Other providers may be paid through a DRG mechanism; physician services for inpatient hospital care, for example. This would require some modification of the current DRG definitions. However, long-term care will be difficult to include in a DRG payment system because diagnosis is less relevant for measuring resource use than, e.g., activities of daily living.

An episode of illness is, for a Medicaid population, a possible payment unit. This unit lies, in terms of inclusiveness, between capitation and DRGs. An example of an episode category might be pregnancy. A single payment would cover all prenatal, delivery, and postnatal services. Oddly, this is an old payment unit -- obstetricians have priced their services in this way. However, insurance payment practices (payment per service) encouraged use of more services and separate pricing of services. In a sense, the system may slowly be working its way back to where it started.

C. Relative Weights

Like DRGs, the relative weights should become more accurate and more inclusive. For example, current DRG weights assume that all hospital days cost the same amount. However, it seems reasonable to assume that more nursing time is required for the first few days of an admission or just after surgery than is required just before discharge. Accounting for these differences would produce more accurate weights. In addition, if DRG categories are used to pay for services or costs not now included in the DRGs, then the weights will necessarily change. Thus, including capital expenses could modify the DRG weights. This is also true for including physician services, education, and other costs.

DRG weights also will change as hospitals adopt new technologies. Currently, this occurs with a two-year lag. If the state wishes to encourage (or discourage) the adoption of a particular new technology, it may be necessary to adjust the DRG weights administratively. This kind of adjustment has never been done, but the DRG system is quite new. The federal Prospective Payment Assessment Commission may be a resource for dealing with this complex problem as it arises.

D. Prices

In the future, price may be determined, in part, by competitive bids and/or by selective contracting. That is, states may use competitive techniques like selective contracting to price specific DRGs or sets of DRGs. This could be very effective as a Medicaid cost-containment strategy. More generally, approaches such as competitive bidding or selective contracting for specific services by DRG could provide a cost-containing impetus for each hospital to specialize in those services which it provides most efficiently. Statutory language in Michigan directs that state's Medicaid agency to evaluate such approaches to DRG based reimbursement.

However, the cost-containment potential of DRG-based selective contracting is potentially in conflict with a second important consideration relating to the complexity of the health care delivery system itself. To deal with this complexity,

hospital grouping is technique commonly employed by the states that have implemented prospective systems. Over time DRG prices may vary more by hospital type (where type represents a separate role in the health care delivery system). If hospital group characteristics are recognized when setting prices, it could substantially offset pressures for hospitals to abandon certain high-cost traditional roles, e.g., research, tertiary care, emergency services, care for people with multiple health/social problems, and others. Alternatives to hospital groupings could also be used by states to address this problem. For example, additional price factors for research or other special functions could be added to standard DRG rates.

More generally, it is apparent that health care payment systems will encompass more types of expenses (capital, education) and more types of services (physician, outpatient care). The DRG hospital payment system is a significant step in that direction. The desire for more all-encompassing prices is already evident in recently adopted federal Medicare capitation policies, state initiatives to offer Medicaid recipients in certain cities the choice of a capitated system, and substantial growth in private sector HMO enrollment. Since capitation payment shifts a large amount of risk from the states to the capitated entity, only large organizations are able to accept capitation payment. Thus, the movement toward even larger bundles of services (from individual services to DRGs to larger DRGs to

capitation) implies a more integrated delivery system and a more corporate style of medical practice. Bundled payment also shifts incentives from over-utilization to incentives that may result in systematic under-provision of service. While a discussion of such changes is beyond the scope of this document, they are important considerations for the future development of state health policy.

APPENDICES

APPENDIX A

Alternative Case Classification Systems

The DRG classification system is one of several approaches available for classifying hospital admissions. For these reasons, it is important that state Medicaid officials be aware that there are alternatives to DRGs as the standard for measuring differences in resource requirements across different classes of patients.

In addition to the Yale DRG classification system, the following five patient classification systems have been developed:

- disease staging,
- patient management categories (PMCs),
- severity of illness index,
- acute physiology and chronic health evaluation (APACHE II), and
- medical illness severity grouping system (MEDISGRPS).

Brief descriptions of each of these alternative systems are provided below, followed by a discussion of the criteria states may wish to consider when selecting a Medicaid hospital reimbursement classification system. The descriptions of the alternative classification systems have been drawn from information

presented in the 1984 annual supplement of the Health Care Financing Review published by the Health Care Financing Administration.

1. Disease Staging

The disease staging classification system assigns each admission to one of more than 400 conditions and then to one of four stages (five in the case of cancer) of disease progression. This results in over 1,700 possible categories. This is a very large number of categories for a state to attempt to price and for a hospital to use for internal management. The stages represent the progression from minimal disease to death. Unrelated secondary diagnoses are also staged. A computerized version of the staging classification scheme has been developed that uses data from the Uniform Hospital Discharge Data Set (UHDDS).

Disease staging is an academic system. The criteria for determining the stages were defined by specialists based upon their clinical experience, rather than through an empirical analysis of actual data on length of stay or resource consumption. The system considers secondary diagnoses in classifying cases. Other factors such as age, procedures, and transfer affect the classification in only a small number of conditions. Under certain circumstances the computer program will reorder diagnoses if the principal diagnosis is vague or if another

diagnosis appears likely on clinical grounds to be the principal diagnosis. If used for payment, the re-coding of diagnoses would probably be controversial.

2. Patient Management Categories

A second case mix classification system, patient management categories (PMC), has been developed by researchers at Blue Cross of Western Pennsylvania. This system, in a computerized version, classifies patients into broad disease groups according to key diagnosis codes and then into a specific patient management category. Like disease stages, these categories were developed by panels of physicians based on their clinical experience rather than empirical data analysis. Each category is intended to represent a distinct type of illness requiring a distinct type of management. Patient management category emphasizes using multiple diagnoses to define the specific management category to which a patient is assigned. However, procedures are sometimes used to define categories when the diagnostic system does not have sufficient specificity. Within a disease group, a patient is assigned to the PMC which is expected to be most resource-intensive, but a patient could be assigned to PMC's in two or more disease groups. A method of combining multiple grouping for reimbursement is currently under consideration. Thus, patient management categories should be viewed as still under development.

3. Severity of Illness Index

The severity of illness index, developed at Johns Hopkins University, represents an ambituous but subjective approach to resource measurement. It assigns cases a score based upon on a four-point scale using an "implicit" synthesis of seven subscale ratings. The use of this technique for payment is, at best, problematic.

4. Acute Physiology and Chronic Health Evaluation

The acute physiology and chronic health evaluation (APACHE II) (Wagner, 1984) developed at George Washington University, is the only system which assigns cases a score on a continuous scale rather than assigning a case to a category. APACHE II is of particular interest as a potential DRG improvement because it uses empirical data, that is, admission values on twelve physiologic variables, such as blood pressure in addition to information about chronic health conditions to produce a continuously variable score. APACHE II has been extensively tested on intensive care patients but not on other patients. It has not been tested as a general predicter of costs. Thus, its potential for DRGs is several years from realization.

5. Medical Illness Severity Grouping System

A fifth approach, the medical illness severity grouping system (MEDISGRPS), has been developed at St. Vincent's Hospital in Worcester, Massachusetts. MEDISGRPS also uses empirical data -- admission values of a set of physiologic variables and clinical and X-ray findings -- to give the patient an admission severity score on a five-point scale. A second set of measurements is recorded a fixed time after admission, as further information for its patient classification. MEDISGRPS was developed as a quality assurance tool and has been implemented at a number of hospitals for this purpose. It is at an early stage of development for use within a a reimbursement system, but like APACHE II, it shows promise as a refinement to the current DRGs. MEDISGRPS requires physiologic information which is not available in the standard UHDDS data.

APPENDIX B

A MULTI-VARIATE APPROACH FOR CLASSIFYING HOSPITALS AND COMPUTING BLENDED PAYMENT RATES

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ABSTRACT

A MULTI-VARIATE APPROACH FOR CLASSIFYING HOSPITALS AND COMPUTING BLENDED PAYMENT RATES

Prospective payment for inpatient hospital care is based on the ideal that hospitals which produce similar outputs, as measured by the types of cases the hospital treats, should be paid similar prices. However, similar output is a multi-dimensional concept. Thus, operationalization of this ideal will ultimately require a more complex framework for determining hospital payment rates than currently employed at either the federal or state level.

This article illustrates a multi-dimensional approach to achieve this objective. This technique, called Grade of Membership, is used to generate a unique type of hospital group and to characterize individual hospitals in terms of their degree of similarity to these groups. In addition, a new concept of grouping is described, a variable set based on hospitals' internal cost structure is developed and used, and ordinary least squares regression is employed to compute prices for these groups. These groups are compared to more conventional groups using simulation analysis.

A MULTI-VARIATE APPROACH FOR CLASSIFYING HOSPITALS AND COMPUTING BLENDED PAYMENT RATES

I. INTRODUCTION

The passage of the Social Security Amendments of 1983 charted a new direction for hospital payment. Hospitals will soon be paid national flat rates per Diagnosis Related Group (DRG) adjusted only for wages, teaching intensity, and urban or rural location. This simple payment structure assumes that these factors and DRG case mix are the only justifiable reasons to differentiate per admission payment rates. In contrast many state prospective payment programs (PPS) have used hospital peer groups as a way to differentiate payments across hospitals. These states include Pennsylvania, Ohio, Maryland, New York, Massachusettes, Georgia, Wisconsin, and Alabama. Their concern is that hospitals are more complex than envisioned by the Medicare's PPS. That is, if some heterogeneity across hospitals is socially and medically desirable, then the longer term consequences of forcing almost complete uniformity on hospitals from above are potentially serious.

Variables used for grouping at the state level include location in specific areas, bedsize, payer mix (high percentage Medicaid), medical teaching, the presence of specific service capabilities at the hospital, and DRG case mix. Currently grouping methods fall in two general categories. The simplest approach is cross classification of hospitals using a few variables. For example, Medicare used seven bedsize categories and urban/rural location variables to create groups for its per discharge payment limits*; Maryland began with simple location groups and then evaluated the internal homogeneity of these groups in search of additional classification variables that were then used to create more cost homogeneous peer groups. More complicated methods involve "clustering," and utilize

more variables. For example, New York uses a technique called "seed" clustering. This procedure produces a "peer group" for each hospital (i.e., the set of hospitals most similar to that particular facility). Each hospital is the center of its own unique group. Massachusettes used principal components to reduce the number of grouping variables and cluster analysis to form groups from these principal components. Georgia uses the same two techniques in combination but with different variables.

II. CURRENT GROUPING TECHNIQUES

A. Problems With Current Grouping Variables

There are several reasons one might wish to classify hospitals into groups. The classification variables (and method) finally chosen should depend on the rationale for classifying in the first place. Reasons for classifying hospitals include:

1. Production homogeneity

Psychiatric hospitals are engaged in the long-term treatment of mental illness. Many short-term general hospitals intervene during a crisis point of an individual's mental illness. Thus while both types of hospitals might treat individuals with the same diagnosed illness, it is clearly not appropriate to apply the same standard to such different products. This is one reason that psychiatric hospitals/units were excluded from prospective payment by Medicare, the Commonwealth of Pennsylvania, and the state of Ohio. An improved approach to hospital grouping, coupled with a multi-dimensional approach to case-type categorization (see Manton, Vertrees, 1984), would allow the Prospective Payment System (PPS) to incorporate these excluded hospital types thereby simplifying the system.

2. Defining health care role

A related reason to classify hospitals is that hospitals play different roles in health care delivery. For example, a hospital in a relatively isolated rural area may need certain types of stand-by capacity that

a community hospital in an urban setting would not. Some hospitals may systematically admit more seriously ill patients of a particular type than average due to their role as a tertiary care referral center (e.g., teaching hospitals, childrens hospitals, and specialty hospitals). As another example, two hospitals in the same metropolitan area may serve very different populations. One hospital, located in the inner city, could have patients whose medical problems are made more difficult to treat by social and economic factors, factors unrecognized by DRGs. Thus, the inner city hospital could have higher costs for necessary treatment of the same conditions than a surburban hospital. Unfortunately if the inner city hospital had been resource starved, then neither the DRGs nor current DRG payment rate differentials will adjust for this problem. Since the concept of role in health care delivery is multi-dimensional, only a multivariate approach would have the capability to adjust for a hospital's role in health care.

3. Control for unmeasured factors

Hospitals may be grouped to account for the cost effects of factors that cannot be measured. For example, prior to the DRG method of measuring case mix, the Medicare program grouped hospitals by bedsize and location (urban/rural) to account for the effects of patient case mix on routine per diem costs. This is an important motive in the state systems, (except for Pennsylvania) noted above. Prior to the development of the hospital wage index, Medicare used per capita income grouping to account for wage differences across areas. One major rationale for the teaching adjustment (i.e., the much higher rates paid to teaching hospitals) in Medicare's PPS is that teaching is believed to be correlated with unmeasured differences in severity of patient illness across hospitals. Severity of illness, then, is also related to the hospital's role in delivering health care, but illness severity is only one dimension of the differences across

hospitals that are a function of hospital roles in health care delivery.

Unfortunately variable selection has often been confused with predicting average cost for individual hospitals. This is understandable since cost related groups will tend to minimize the financial impact of a payment reform. Of course, the states and Medicare all recognized that cost per se was inappropriate as a grouping variable, since grouping by current average cost level is not conceptually equivalent to grouping by factors that influence costs. The point here is that, while one might expect groups to mirror costs to some extent, this should not be the only criteria for choosing grouping variables.

Since, we know that the cost of treatment varies considerably across hospitals, based largely on their characteristics, it would not be fair to pay everyone the standardized cost determined for the "average" hospital. If this were done, the payment for some hospitals would be greater than necessary, while other hospitals would not receive enough payment. By grouping hospitals we can determine differential payment rates which will vary according to the variables used to create the hospital groupings. Thus, the broad objective in grouping hospitals is to select variables which combine hospitals that have the potential for similar costs. Thus the utility in reimbursement by hospital group is to standardize cost amounts equitably for all hospitals in the group, i.e., all hospitals with the potential for similar costs.

B. Limitations Of Current Grouping Methods

Perhaps the most important and basic limitation of past grouping procedures is the logical basis on which the groups were formed. In all cases groups were formed as mutually exclusive categories. Any finite discrete categorization can not reflect accurately the true heterogeneity of a complex, multifunction institution like a modern hospital. This is one reason that researchers at HCFA chose a continuous measure for teaching

instead of the more common (e.g., New Jersey) major and minor discrete teaching categories.

The use of discrete categories is a serious problem. If, under prospective payment, teaching hospitals were categorized into three instead of two groups and nothing else changed, the profitability of all of these hospitals under the payment system would be seriously altered. This is because the mean cost for three groups would be different and would therefore result in different payment rates for each hospital as compared to the mean cost rates derived from two groups. The only other previously available alternative, the "seed clustering" approach used by New York State, suffers from an equally serious flaw; "the peer group" cost of the most expensive hospital must be less than that hospital's cost. Thus, at least some hospitals must be underpaid if this method were used to directly set payment rates. This argument holds also in converse for the inexpensive hospitals. In addition, the selection of a particular "seed cluster" model suffers from the ambiguities of other clustering methods described below.

Prior efforts at hospital grouping are subject to several additional methodological and conceptual limitations. First, when objective statistical procedures were used in these classification exercises, the procedures employed were not always based on rigorously developed statistical theory. These procedures, generically called cluster analysis, though useful as data reduction techniques, differ greatly in the assumptions they embody so that the selection of a specific cluster analytic model involves a series of complex decisions. Model selection is sufficiently difficult that Bartko (1980) suggested that one approach to increasing confidence in the classification system produced by a particular clustering algorithm is to use five or six different clustering procedures and determine if the results are consistent across procedures. Obviously, in addition to being

practically difficult, Bartko's suggestion offers few guidelines if inconsistent results are produced.

The use of subjective techniques involve perhaps even more difficult analytic limitations. For example, such procedures generally assign unit weights to variables so that the selection of redundant (i.e., highly correlated) variables will weight a classification in a given direction. It is also difficult for subjective procedures to deal with multidimensional classification and with complex quantitative factors (e.g., depreciation rates) in generating a classification system.

C. Alternatives To Hospital Grouping

An alternative to grouping hospitals is to adjust the standardized price level for variables which legitimately affect hospital cost. To a limited extent, this is the approach taken by Medicare's (PPS). Medicare's system standardizes cost by removing the factors of case-mix, indirect medical education costs, variation in hospital wage levels, and cost of living variation (Alaska and Hawaii). By adjusting for these factors, Medicare is able to compare the costs of hospitals under similar situations, i.e., if there were no indirect education costs, if wage levels were the same, etc. Medicare handles these variables by standardizing the costs prior to calculating the average cost per case, then reintroducing these factors for payment.

Medicare does group hospitals by two characteristics, however. Hospitals are grouped by geographical area into nine census regions. These are additionally classified as either "urban" or "rural"for a total of 18 different hospital groupings. A hospital is grouped "urban" if it is located within an MSA (Metropolitan Statistical Area), and "rural" if it is located outside an MSA. However, since the regional standard costs are a declining percent of hospital payment levels, the regional standards will decline in importance. By the fourth year of implementation the

regional categories will be entirely replaced by simple urban or rural groups, the wage adjustment and a large adjustment (even at half its 1984-85 level) for the indirect cost effects of teaching programs, a surrogate variable. The various categories of excluded hospitals or units (e.g., psychiatric, rehabilitation) represent an important residual level of hospital classification. Thus, for the Medicare PPS, it was found necessary to group short term acute care hospitals, and to exclude large groups of other hospitals. This suggests that there are real hospital types which are distinctive as a class, both in service profile and function even within the short term acute care category. We should also note that Medicare bases a large fraction of its initial (first and second year) rates on the hospital's own cost experience. Thus, the initial Medicare system is, to a large extent, hospital specific, i.e., each hospital is, in part, its own group. Hospital specific rates are useful as a transition mechanism from cost based reimbursement to prospective payment. Hospital specific rates, however, suffer from a short-coming that limits their long term utility. Specifically, they reward (with high rates) hospitals which have historically been inefficient and they punish (with low rates) hospitals which have historically been either efficient or cash-poor, e.g., county hospitals. Thus, on equity grounds, historical hospital specific rates are a poor long term solution. However, the concept of hospital specific rates which recognize the unique dimensions of hospitals is an important one.

It appears that the best approach to adjust for hospital characteristics through the price structure is by using a combination of categorical distinctions and continuous gradings. This approach is recognized in the logical structure of Medicare's PPS, where both judgment and practical politics led to the development of the combined classification described above. What we hope to do in this paper is to recognize this reality and

to provide an analytic procedure which implements that logic but in an objective and statistically rigorous way. In addition, we will also be able to use more variables for classification than either Medicare or any state system that we are aware of.

III. A NEW METHODOLOGY FOR GROUPING

A. The New Variable Set

It is evident that hospitals play different roles in delivering health care. Prior grouping efforts have not considered role but, instead, used specific hospital characteristics (including location) to adjust for differences which are believed to affect costs. This is a different concept than continuously adjusting hospital rates for differences in factor input prices or adjusting rates for differences in case mix (i.e., DRG prospective payment). The concept of role differences is another aspect of DRG case mix measurement, more nearly reflected by Medicare's teaching adjustment.

Prospective payment is a comparative system. Therefore, it is important to recognize that the real purpose of hospital grouping is to be certain that only hospitals with similar attributes and therefore similar cost potential are compared to each other. Under Medicare's PPS, two urban teaching hospitals in the same region will be paid the same rate for treating cases in a particular DRG. The issue is whether these hospitals necessarily have the same cost potential, or whether there is another, more complex dimension of hospital care that must also be considered.

To summarize our argument for grouping hospitals: under prospective payment, it is necessary to define "like hospitals." Like hospitals are hospitals with similar roles in delivering health care. Hospitals with similar roles should experience similar costs for providing specific services and for treating particular types of cases. We will refer to the relative costs of treating specific types of cases within a hospital as

the hospital's "cost structure." A reasonable objective of hospital grouping is to identify hospitals whose structure (not necessarily level) of treatment costs across types of cases is similar. These hospitals will have the potential for similar cost levels since they have similar roles in the delivery of health care. Thus, cost structure homogeneity is the primary factor that has been omitted in prospective payment system designs to this date.

There are three basic ways to accomplish this objective of measuring cost structure within and across hospitals. First, and most traditional, cost structure could be measured through surrogate variables, e.g., bed-size, teaching status, location etc. Second, cost structure could be measured directly. The second method has heretofore not been attempted. Third, the sources of the higher costs; high cost, high technology medical equipment could be used as grouping variables. In the following section we describe a method for identifying groups of like hospitals and employ this method using the first two types of variables. We will be able to compare groups created from surrogate variables with groups created directly from cost structures. In addition, we are able to compare the results of our grouping method with a fairly sophisticated but traditional grouping technique.

B. The New Grouping Model

In order to capture more dimensions of hospitals than teaching and to retain the concept of a continuous measure as developed at HCFA, we selected a classification scheme which emobides a logically different approach to classification. This approach called "fuzzy set" classification, involves both the notion of logically distinct classes of objects along with the concept of a "graded" response or degree of membership in those categories. A classification which involves both components can obviously be more flexible and effective in its representation of the real complexity

and heterogeneity of hospitals. With such a classification system we can generalize our adjustment of the DRG reimbursement levels to reflect continuous gradations in hospital function on a multidimensional basis by identifying discrete dimensions of hospital types and using blending or mixing coefficients to generate a weighted composite hospital adjustment.

Thus, an appraoch based upon a "fuzzy set" classification procedure will avoid the boundary problem: the error in categorization generated by forcing things that vary continuously along multiple dimensions into discrete categories.

In the following sections we first describe the Grade of Membership (GOM) technique for creating "fuzzy set" groups. Next we apply GOM to data from hospitals in Pennsylvania. In this analysis we use both conventional hospital attributes and hospital cost structure as grouping variables. We limited our analyses to short term acute care hospitals because we had relatively few other types of hospitals in our data base and because DRGs are not suitable for some hospital types, e.g., Drug and Alcohol Treatment Centers. Our results, in effect, define "pure types" of hospital groups for short term acute care hospitals. Following that, we describe an approach to pricing these pure type concepts using both discrete and continuous factors derived from our analysis and present a set of prices for both sets of pure types hospitals. Our concluding section is a simulation study of these techniques as compared to the more conventional fixed boundary grouping approach.

IV. GRADE OF MEMBERSHIP ANALYSIS

The basic classification procedure we will use is called the Grade of Membership model. This model was originally developed to identify clinically meaningful patient subgroups based upon a large number of symptoms and clinical signs (Woodbury and Manton, 1982) by using the "fuzzy set" approach to categorization. Its utility as a general pattern

recognition model (Bezdek, 1982) has been demonstrated in its application to wide variety of survey and administrative records (e.g., Manton et al., 1984; Manton and Vertrees, 1984; Blazer et al., 1983; Siegler et al., 1984).

The basic structure of the GOM model is simple. It can be described by a single equation. To be specific let us assume that we have measurements on J variables (j=1,2,...,J) for I persons (i=1,2,...,I). Since the analysis deals with categorical variables we will need to transform continuous variables into as many discrete categories as is needed to describe the continuous distributions. With each of the J variables transformed into a set of ℓ discrete response levels (ℓ=1,2,...,L_j), we then code the data set as 0,1 variables where a 1 indicates that the ith person has the ℓth response to the jth variable. All other L_j-1 responses to the jth variable for that person will be coded to 0. These binary variables may be written as $x_{ij\ell}$. The GOM model estimates two types of coefficients to predict the $x_{ij\ell}$ as accurately as possible using a set of K basic response profiles. The first type of coefficient describes each profile in terms of the probability that a person with this profile had a particular response to a given variable. These coefficients may be written as $\lambda_{kj\ell}$. The set of K profiles may by described by examining the set of $\lambda_{kj\ell}$ for each profile in much the same way that factors from a factor analysis may be described by looking at the pattern of factor "loadings", i.e., the set of correlations between a factor and observed measurements. The second type of coefficient describes how strong the relation is between a person's observed pattern of response (i.e., his $x_{ij\ell}$'s) and each of the K sets of analytically determined profiles. These coefficients may be written as g_{ik} and are constrained, for each person, to a.) fall into the range 0.0 to 1.0 and b.) for the ith person sum to 1.0 over the K profiles (i.e., $\sum_K g_{ik} = 1.0$). These coefficients may be viewed as similar to factor scores as produced in factor analysis. They are different in

that factor scores are a.) not constrained to be positive, b.) not constrained to sum to 1.0 and c.) factor scores are not estimated simultaneously with factor loadings. With these definitions the basic GOM model is written,

$$\hat{x}_{ij\ell} = \sum_k g_{ik} \cdot \lambda_{kj\ell} \qquad (1)$$

where $\hat{x}_{ij\ell}$ is the probability that the ith person has a specific response based upon the estimates of g_{ik} and $\lambda_{kj\ell}$. One can see that, where one of the $g_{ik} = 1.0$, (and hence the other K-1 g_{ik}'s are 0.0) the predicted responses for the ith person will be exactly equal to the $\lambda_{kj\ell}$ for one of the profiles. The fact that the g_{ik} need not be 1 or 0 (and hence a person may be a weighted mixture of two or more response profiles) gives this model considerable flexibility in describing very complex medical data in terms of a small number of basic response patterns. The fact that the g_{ik} are estimated in the model also means that differences in sampling can be captured in the g_{ik} and need not be confounded with the estimates of the $\lambda_{kj\ell}$. Indeed, since the g_{ik} are estimated there is no need to make distributional assumptions as are required in calculating factor scores.

The g_{ik} and $\lambda_{kj\ell}$ are estimated by maximum likelihood procedures with constraints to insure that the coefficients fall in the correct ranges (i.e., that the g_{ik} are positive and sum to 1.0 so that they can be used as weighting factors). The basic estimation equation can be written as,

$$\mathcal{L} = \prod_i \prod_j \prod_\ell (\hat{x}_{ij\ell})^{x_{ij\ell}} \qquad (2a)$$

or writing (1) into (2)

$$\mathcal{L} = \prod_i \prod_j \prod_\ell (\sum_k g_{ik} \cdot \lambda_{kj\ell})^{x_{ij\ell}} \quad . \qquad (2b)$$

Basically the program iteratively picks trial values of g_{ik} and $\lambda_{kj\ell}$ until $\mathcal{L}$ (or its logarithm) is at a maximum. At this point the predicted values $\hat{x}_{ij\ell}$ are as close as possible (given the number of profiles, K, selected)

to the observed values, $x_{ij\ell}$. When one increases the value of K one has more coefficients and can better predict the $x_{ij\ell}$ so that $\mathcal{L}$ will increase. The increase in $\mathcal{L}$ when a profile is added can be shown, according to maximum likelihood theory, to be distributed as $-\frac{1}{2}\chi^2$ so that minus twice the change in the likelihood function is χ^2 distributed with degress of freedom equal to the number of g_{ik}'s and $\lambda_{kj\ell}$'s estimated. This χ^2 value can be referenced to standard tables (with appropriate degrees of freedom) to determine if the K+1 profile significantly improved our prediction of the $x_{ij\ell}$. Thus selection of the "right" number of groups can be done with classical principles of statistical inference. Often more ad hoc classification procedures do not have such statistical tests for selecting the correct number of groups.

In addition to having well defined statistical decision criteria the model has other useful statistical properties. For example, when data is missing on a variable the exponent in (2b) is equal to zero so that the term does not affect the likelihood function. Thus the model deals appropriately with missing data. The categorical nature of the model means that it is not sensitive to scaling assumptions. Finally, because the g_{ik} are estimated in the model the $\lambda_{kj\ell}$ estimates (i.e., the definition of the profiles) are not sensitive to distributional assumptions or sampling problems. Thus the procedure has useful mathematical properties because of the restrictions of the coefficients and useful statistical properties because of the way the parameters are estimated.

V. DATA AND COST STRUCTURE DEFINITION

The data used in our evaluation came from two sources. The first source are the cost reports filed with the Pennsylvania Medicaid system. These data include several relevant characteristics of individual hospitals. The second data source was Medicaid claims for the Commonwealth of Pennsylvania for the years 1982 and 1983 (N = 340,000). The charge

data on the individual claims were transformed into cost data for 230 acute care hospitals by claim specific costing techniques and then by averaging, within hospital, individual patient treatment costs within a selected set of most frequent DRGs (excluding psychiatric DRGs) and residual Major Diagnostic Categories (MDCs) (broken down into surgical and nonsurgical subcategories where adequate numbers existed). These average hospital costs for individual DRG and MDC categories were then recoded. The recoding depended upon a hospital's relative position in the distribution of average hospital costs for a given diagnostic category (i.e., 0 to 5 percent = 1; 5 percent to 25.5 percent = 2; 25.51 to 75.50 percent = 3; 75.51 to 95 percent = 4; 95.1 to 100.0 percent = 5). Thus the data were transformed from cost levels into a measure of relative cost structure for DRGs and MDCs. That is, the relative cost position of a hospital is determined for each MDC and DRG without regard to its absolute cost level over MDCs and DRGs. The purpose of converting cost data into relative categories, i.e., into hospital cost structure is to capture the fact that the modes of production of specific services will interact across types of cases treated. A high correlation among relative cost structures can be expected. Our conversion of continuous variables to categorical variables, also serves to minimize the effects of errors in the data.

VI. RESULTS

As discussed in the Methods section our data need to be recoded as a set of $x_{ij\ell}$'s. In the analysis, hospitals represent the cases to be analyzed (i.e., I = 230). We actually performed two sets of GOM analyses. The first was an analysis of 61 cost variables. In that analysis J = 61. Each of these variables represented the distribution of mean costs for a given medical category over the 230 hospitals. As discussed above we divided that distribution into five costs levels based upon the average cost of that hospital relative to the average costs of all other 229

hospitals. Hence, for their analysis there are always five (i.e., $L_j = 5$) response levels for the 61 cost measures. We attempted to predict the $x_{ij\ell}$ for the hospitals with 3,4,5, and 7 profiles (7 was the number of groups used by the Pennsylvania Hospital Association). We found that the increase in predicting the data was significant when going from 3 to 4 profiles (i.e., $\chi^2 = 701.0$ with 535 d.f., there are 230 g_{ik}'s estimated and 305 $\lambda_{kj\ell}$'s) but was not significant when going from 4 to 5 profiles (i.e., $\chi^2 = 499$ with 535 d.f.). Hence, it was decided that four profiles (i.e., K = 4) best described the set of 61 cost measures over the 230 hospitals. The seven profile analysis was not significantly better than the five profile run.

An additional feature of the GOM analysis is that, within any analysis, we can include a set of variables for which we calculate $\lambda_{kj\ell}$'s but which do not change the prediction of the data (i.e., in the calculations they are not allowed to affect the likelihood value, $\mathcal{L}$). In the first analysis we included a set of 16 hospital attributes as such "external" variables. The external variables do not affect the definition of the profiles. The $\lambda_{kj\ell}$ for these variables do tell us how these varialbes relate to the profiles.

The second GOM analysis was also run with the hospitals as cases (i.e., I = 230) but used 16 hospital attributes (i.e., J = 16) to define the profiles. Since, the 16 different measures represented very different phenomena the number of response levels (i.e., L_j) was selected to best describe each distribution. Hence L_j differs between variables. As for the cost measures we could test to see how many profiles are required to describe the variation of hospital attributes. We tested 3,4,5, and 7 profiles. The difference between 3 and 4 profiles was again statistically significant (i.e., $\chi^2 = 499.8$ with 326 d.f., this represents 230 g_{ik}s and 116 $\lambda_{kj\ell}$'s for each additional profile) while the difference between

4 and 5 was not (i.e., χ^2 = 309.6 with 326 d.f.) the test between 5 and 7 profiles was also not significant. Thus we selected the analysis with four profiles (i.e., K = 4) as best. As in the first analysis external variables were included. In this case the order was revised and the 61 cost variables were included as external variables.

In Table 1 we present the $\lambda_{kj\ell}$ coefficients associated with the profiles based on the cost structure variables for selected DRGs and MDCs. To read this table we need to examine the six columns in Table 1. The first column contains the variable name and the response levels for that variable. The second column gives the probability distribution for each variable across all hospitals. For example, 5.14 percent of the hospitals in Pennsylvania had costs for DRG 14 in excess of $17,576. In columns three to six the $\lambda_{kj\ell}$s derived from the model we presented. We see that pure type 1 hospitals have a 69.21 percent probability of experiencing costs in the $8529 to $17,575 range and a 30.81 percent change of experiencing costs in excess of $17,576. The probabilities shift upward as we read across the remaining three pure types. This indicates that there is a rather consistent decrease in cost from pure types 1 to 4 for this DRG. This pattern (i.e., lower costs for profile 4) holds across virtually all of the DRG and MDC categories.

Table 1 About Here

The fact that there appears to be such a high correlation between costs for such a variety of DRG and MDC categories suggests that there is a strong interaction in the production of services appropriate to respond to these health problems. A more complete understanding of this can be obtained by examining how the groups formed on the basis of the relative cost structure relate to hospital attributes. This can be examined by including the hospital attribute variables in the GOM analysis as "external" variables (i.e., variables for whom the $\lambda_{kj\ell}$ are calculated but

which do not affect the group definitions). These coefficients are presented in Table 2. The method of interpretating these coefficients is the same as for the internal variables described above.

Table 2 About Here

From Table 2 we see that the relative cost structure has done a reasonably good job of defining meaningful hospital types. For example, the first type of hospital is clearly a large, metropolitan teaching hospital with large proportions of care funded under Medicaid, and high proportions of intensive care. The case-mix index variable suggests that these hospitals tend to handle diagnoses associated with greater costs. The fourth type of hospital is clearly small, generally in rural areas, with a large proportion of services provided for maternity care and low bed occupancy rates. The case-mix measure suggests that hospitals of this type deal with less expensive diagnoses.

The two intermediate hospital types, though similar in size, are different in terms of a number of characteristics. The second hospital type is more likely to be located in large metropolitan areas, have a more serious case mix, have higher per diem and per bed costs, and have resident training programs. The third hospital type has a higher proportion of care devoted to newborns, is more likely to be in medium-sized urban areas, and is less likely to have large resident training program. Thus, the hospital groups defined solely on the basis of the relative cost structure over diagnostic categories are predictive of significant differences in terms of major hospital attributes.

Our next question is how the four groups would be differently defined if instead of cost structure, the hospitals' attributes were used as the "internal" or grouping variables. This analysis is more like prior efforts at grouping hospitals because we are basing the groups on

hospital attributes. The $\lambda_{kj\ell}$ coefficients for this analysis are presented in Table 3.

Table 3 About Here

A comparison of the coefficients in Tables 2 and 3 certainly shows that the patterns observed in Table 3 are now more crisply defined. However, despite the fact that they are similar on a number of hospital attributes (e.g., hospital size, level of newborn care, costs per diem), there is a shift in the definition of the two intermediate groups. Most notable is the fact that the second hospital type now has distinctly lower Medicaid costs than the third type. Also significant is the fact that the second hospital type now has a lower level of expenditures on residency training programs, while the third pure type now has a greater level of resident training costs. We also see that in contrast to the grouping based on hospital cost structure, both the second and third pure types are located in medium-sized metropolitan areas. The shifts in the definition of the second pure type suggests that there is a distinct nonlinearity in the change in relative cost structure over pure types two and three.

In order to evaluate the classification, we also need to know how crisply the hospitals are grouped according to the relative cost profiles presented in Table 1. That is, since GOM allows a hospital to be partially characterized by the profiles, we are interested in how well the hospitals are distributed within single groups. This may be evaluated by examining the g_{ik}'s for the relative cost variables. These are presented in Table 4.

Table 4 About Here

We can see that types 1 and 4 are the most crisply defined groups, that is, hospitals tend to clarify fit into these groups or not. For

example, the first hospital type, representing large teaching hospitals, has a clearly defined structure with 11 hospitals nearly exactly matching the pure type attributes. The three middle groups are less clearly defined (i.e., smaller g_{ik}'s) representing, as they do, medium size facilities. In general, however, though the hospitals can be unambiguously assigned to one of the four hospital types (i.e., 214 of 230 with $g_{ik} > 0.5$) there is considerable heterogeneity of individual hospitals.

VII. BLENDING RATES

As indicated in our earlier discussion, we will use a strategy for determining price levels that has both discrete and continuous components. Both the discrete and continuous components are defined by the GOM analyses presented above. The "discrete" component involves the identification of logically discrete dimensions, here the hospital types, that best describe the variation of the internal variables, i.e., the hospital attributes or the relative cost structures. The continuous component is the mixing or blending of each of the logically distinct components to best describe the observed attributes of any given hospital. The blending coefficients are the g_{ik}'s which relate each hospital to each of the K hospital types.

Our goal is to create a price level for each pure type and use these pure type price levels to create a unique set of DRG prices for each hospital. Our approach recognizes the unique characteristic of each hospital because it does not require that hospitals be grouped into artifically "similar" categories. For example, assume that the price level for pure type one is $3,000 and the price level for pure type two is $2,000. Hospital 1 is described as 50 percent pure type one and 50 percent pure type two. In this event, the price level for this hospital would be $5,000/2 + $2,500. Another hospital that was more like the expensive pure type (i.e., the g_{ik} on the first pure type for the hospital is greater than 0.5) would receive a higher rate while a hospital more

like pure type two would receive a lower rate. We have achieved the objective of developing a continuous rate adjustment method, like Medicare's "teaching adjustment", but our method allows adjustment for all of the factors that could or should affect hospital costs. Therefore, we are not required to make assumptions about the relationship of a single variable (residents per bed) to all other relevant factors.

However, at this point our problem is that most hospitals cannot be uniquely assigned to any single type, e.g., the "pure type" hospital is unobserved. Thus, a method to derive price levels using the g_{ik}'s and the hospital's average cost per case is required. We are aided in this effort by the Commonwealth's goal of creating hospital groups that minimize the gains and losses across hospitals due to prospective payment. In addition of course, these prices must achieve the longer term goal of recognizing that cost structure differences across hospitals reflect real differences among hospitals in their respective roles in health care delivery.

In order to understand the solution to this problem, it is useful to look at a hospital's payment under the DRG system. If we let P_k represent the price load of pure type K, then under this blended rate concept hospital i's average reimbursement (AR) will be:

$AR_i = (g_{i1} P_1 + g_{i2} P_2 + g_{i3} P_3 + g_{i4} P_4)*CMI_i$, where

g_{ik} is the grade of membership (the blending coefficient) of hospital i in pure type K, and CMI_i is this hospital's Medicaid case-mix index. Since this CMI_i is simply the average DRG relative value for the hospital, the product of this and the blended rate must equal the hospital's average DRG revenue.

Our unknowns are the P_Ks--the prices for each pure type group. What is needed are prices that minimize the differences between the hospital's actual DRG costs and its DRG revenue. Given this objective, we can use ordinary least squares to create the prices. This was done by estimating:

$AC_i/CMI_i = g_{ik} P_k + e.$

Since AC_i/CMI_i was skewed, so we also estimated:

$LN(AC_i/CMI_i) = g_{ik} P_k + e.$

The linear equation actually estimated using the four pure types based upon hospital attributes was

$$AC_i/CMI = (\$2925)* g_{i1} + (\$1640)* g_{i2} + (\$1470)* g_{i3} + (\$1173)* g_{i4} + e$$

$$R^2 = 51.8\%.$$

Thus we see that about half of the variation in average costs over hospitals can be explained by the description of the hospital generated by the GOM model. For example, the cost level predicted for the 11 hospitals very similar to pure type one is $2,925 per case in 1982. For a hospital that had $g_{i1} = 0.5$ and $g_{i2} = 0.5$, the predicted cost was (0.5) (2925) + (0.5) (1650) = 2287.50. These blended predicted costs predicted the cost levels quite well. Using the pure types based upon relative cost structure we obtain:

$$AC_i/CM_i = (2894)g_{i1} + (\$2301)*g_{i2} + (1635)*g_{i3} + (1066)*g_{i4} + e$$

$$R^2 = 55\%$$

We see that not only is the R^2 higher, but also the intermediate hospital types (2 and 3) have more clearly distinguished cost levels.

In order to be sure that the skewness of the dependent variable was not biasing our estimates, we estimated similar ordinary least squares equations using a logarithmic transformation on the dependent variable. These results, converted to real 1982 dollars are presented in Table 5. The results are close to the linear equation estimates.

All equations were estimated with a lagrangian restriction (S.A.S., 1983) in order to provide meaningful statistics for all of the GOM groups. Since we used this technique, we did not need to omit a group and compute

statistics relative to this omited group. All group prices are significant at the 0.001 level. If explained variance were our only criterion, the results would slightly favor cost structure groups with prices estimated from a log-linear function.

VIII. DISCUSSION

What is most relevant at this point is how this approach to setting hospital rates compares to other approaches in terms of hospital profits and losses, e.g., the "bottom line". It is most useful to compare "bottom line" impact to a relevant alternative. In this instance our choice of a relevant alternative is simple. In the course of the design of the Pennsylvania DRG system, the Hospital Association of Pennsylvania (HAP) developed its own grouping method and groups. These HAP groups are currently used to adjust hospital rates under Pennsylvania's Medical Assistance DRG System.

The impetus for the legislation that required the Pennsylvania Department of Public Welfare to pursue DRG prospective payment came, in large part, from hospitals. The Hospital Association recognized that this payment technique could be very advantageous for its members compared to the kinds of reductions (e.g., payment limitations) that would otherwise have been enforced by the Department. This support is consistent with the support given to the concept of Medicare prospective payment by the Washington based hospital lobbies, and reflects a realistic assessment of the probable futures for hospitals under cost based limit systems versus prospective payment.

Part of the Hospital Association's efforts in improving the equity of the DRG payment system involved creating hospital groups. The Association convened a subcommittee of high level hospital officials who decided what variables were appropriate for grouping hospitals. HAP staff then designed a technique that used these variables to create hospital

groups. The first sets of HAP groups combined together hospitals with very different average costs per case. Thus, one objective of both the Association and the Commonwealth, that prospective payment not re-distribute large amounts of money, was not met. After several unsuccessful attempts to fix the problem by reducing the number of grouping variables, HAP staff decided to modify their grouping technique. They borrowed part of the blended rate concept, described above, in order to include average cost per day as a determinent of the grouping effect of each variable. In effect, they maintained a complex version of their original strategy, but modified it in such a way as to produce groups that are very close to the groups one would get if average cost were the only grouping variable. Their study resulted in seven groups. Group one contains the large, high cost, urban, teaching hospitals, group seven consists of small, low cost, rural hospitals.

In order to evaluate the HAP groups against the two sets of GOM groups, we conducted a simulation analysis. In essence, we assumed that each system had been introduced in FY 1983 and that nothing else changed. We constrained the prices of each grouping technique to result in payments equal to FY83 cost based payments, about 484 million dollars. These results are presented in Tables 6 through 8.

In Table 6 we present the changes in reimbursement effected by adjusting Medicaid reimbursement using the HAP groups.

Table 6 About Here

We see, for example, that 32 percent of the hospitals have greater than a 10 percent increase in reimbursement while 23 percent lose more than 10 percent. We see that 37 percent of HAP group 1 (large teaching hospital) receives 10 percent more reimbursement while only 28 percent of HAP group 4 is benefited. Thus there is a differential benefit of the

grouping across HAP types. This is even more marked when examining losses where only 17 percent of HAP group 1 losses 10 percent or more.

We can compare the effects of the HAP grouping in Table 6 with the effects of the GOM grouping based upon 16 hospital attributes presented in Table 7.

Table 7 About Here

In Table 7 we see that less (17 percent) of the hospitals have large losses (over 10 percent) using the GOM groups than using the HAP groups (23 percent). Furthermore, only one of the HAP groups (number 5) has more hospitals with large losses than under the HAP based reimbursement.

In Table 8 we present the impact simulation for the GOM groups based upon the 61 reimbursement measures.

Table 8 About Here

We see that on even smaller proportion (13 percent) of hospitals have large losses using these groups. The only HAP group which has more hospitals with large losses under this grouping is the first. Twenty-two fewer hospitals have large losses under this grouping than under the HAP system.

The GOM groups generally result in smaller profits for those hospitals that make money; and more hospitals would "win" under GOM than under the HAP groups. This is because GOM avoids the boundary problem described above. Thus, under this approach, both low and high cost hospitals tend to receive rates that recognize their unique characteristics and financial requirements.

More intensive analysis using additional hospital characteristics might explain why a small number of hospitals lost under the GOM classification. An examination of the individual hospitals that lost 10 percent or more suggested that they tended to be located in medium sized communities

in suburban areas. They had smaller proportions of Medicaid patients. Hence, the procedure did not give them the contribution to price of indigent patients though their costs were higher due, perhaps to increased amenities.

IX. CONCLUSION

GOM generated a small number of types of hospitals (the pure types) with profiles and attributes as a discrete component and a continuous score (the blending coefficients) that described to what degree any given hospital's characteristics were related to each hospital pure type. This permitted us to use a much more flexible approach to pricing whereby the actual set of prices for hospitals were mixtures of the price levels for hospital types. Thus the price structure could be continuously varied to represent the actual heterogeneity of each hospital within a discrete category.

The application of the GOM model to the grouping problem illustrated several important facts. First, the methodology was able to produce a zero-cost-redistribution of reimbursement to hospitals that produced far fewer large losers. Second, in contrast to the HAP methodology, the procedure is based purely on objective data and objective statistical decision criteria. Thus, the group of large loss hospitals are identified on the basis of reimbursing extra for hospital characteristics that were viewed as enhancing services (e.g., teaching function, dealing with more serious cases in tertiary care centers; adjusting for capital indebtedness; a greater proportion of indigent care) to the community than to increasing amenities or profits. Naturally, the set of hospital attributes in the second GOM analysis could have been modified to represent other cost factors. Given the selection of the grouping variables, however, the resultant grouping is objectively and optimally generated. This will be a critical feature of any grouping system designed to produce a budget

neutral redistribution of reimbursement if it is to pass policy and legal scrutiny.

END NOTES

*Mandated by the Tax Equity and Fiscal Responsibility Act (TEFRA) of 1982.

TABLE 1: The $\lambda_{kj\ell}$'s for a GOM Analysis with Four Profiles (K=4) of 61 DRG and MDC Based Average Cost Measures for 230 Pennsylvania Hospitals in 1982 and 1983

	Observed Distribution Of Costs Over Hospitals	PROFILES $\lambda_{1J\ell}$	$\lambda_{2J\ell}$	$\lambda_{3J\ell}$	$\lambda_{4J\ell}$
Diagnosis Related Group	----------Marginal Frequency----------				
Specific Cerebrovascular Disorders except tia (DRG14)					
≤ $2163	0.0514	0.0	0.0	0.0	0.2160
$2164 - 4025	0.2009	0.0	0.0	0.1192	0.5994
$4026 - 8528	0.4953	0.0	0.3140	0.8396	0.1649
$8529 - 17,575	0.2009	0.6920	0.6360	0.0412	0.0
$17,576+	0.0514	0.3080	0.0499	0.0	0.0196
Seizure and Headache, Age 18–69 without DX2 (DRG25)					
≤ $731	0.0512	0.0	0.0	0.0	0.2345
$ 732 - 1378	0.1953	0.0	0.0	0.0585	0.7655
$1379 - 2655	0.5023	0.0	0.4036	0.9014	0.0
$2656 - 4268	0.2000	0.6206	0.5964	0.0401	0.0
$4269+	0.0512	0.3794	0.0	0.0	0.0
Lens Surgical Procedures (DRG39)					
≤ $1266	0.0479	0.0	0.0	0.0	0.2051
$1267 - 1740	0.2036	0.0	0.0	0.1858	0.5307
$1741 - 2856	0.5030	0.0	0.5054	0.7402	0.2397
$2857 - 4158	0.1916	0.3338	0.4946	0.0740	0.0245
$4159+	0.0539	0.6662	0.0	0.0	0.0
Myringotomy, Age 0-17 (DRG62)					
≤ $335	0.0536	0.0	0.0785	0.0	0.1778
$ 336 - 525	0.2054	0.0940	0.0660	0.2096	0.4217
$ 526 - 915	0.4911	0.4619	0.4712	0.5458	0.4005
$ 916 - 1702	0.1964	0.1780	0.3843	0.1870	0.0
$1703+	0.0536	0.2661	0.0	0.0576	0.0
Oritis Media and Uri, Age 0-17 (DRG70)					
≤ $545	0.0513	0.0	0.0	0.0043	0.1794
$ 546 - 820	0.2051	0.0	0.0404	0.1133	0.5347
$ 821 - 1289	0.5077	0.0	0.5926	0.7167	0.2859
$1290 - 2271	0.1897	0.6408	0.3002	0.1658	0.0
$2272+	0.0462	0.3592	0.0667	0.0	0.0
Chronic Obstructive Pulmonary Disease (DRG88)					
≤ $1568	0.0467	0.0064	0.0	0.0	0.1888
$1569 - 2907	0.2009	0.0	0.0	0.0744	0.6793
$2908 - 6624	0.5000	0.0	0.4917	0.8508	0.1319
$6625 - 11,630	0.2009	0.5812	0.5083	0.0747	0.0
$11,631+	0.0514	0.4124	0.0	0.0	0.0
Simple Pneumonia & Pleurisy, Age > 69 and/or DX2 (DRG89)					
≤ $2234	0.0512	0.0	0.0	0.0256	0.1650
$2235 - 3485	0.2000	0.0	0.0	0.1390	0.5718
$3486 - 7623	0.4977	0.0171	0.3609	0.8354	0.1973
$7624 - 14,078	0.2000	0.6807	0.5489	0.0	0.0659
$14,079+	0.0512	0.3022	0.0902	0.0	0.0
Simple Pneumonia & Pleurisy, Age 0-17 (DRG91)					
≤ $982	0.0531	0.0	0.0279	0.0	0.2040
$ 983 - 1353	0.2029	0.0	0.0	0.1727	0.5197
$1354 - 2768	0.5072	0.0912	0.2881	0.8273	0.2556
$2769 - 7151	0.1836	0.5076	0.6841	0.0	0.0
$7152+	0.0531	0.4012	0.0	0.0	0.0206

TABLE 1 (continued)

Bronchitis and Asthma, Age 18-69, with or without DX2 (DRG 97)					
≤ $1150	0.0469	0.0	0.0	0.0	0.1893
$1151 - 1597	0.2019	0.0	0.0	0.0323	0.7519
$1598 - 3334	0.4977	0.0	0.3673	0.8912	0.0588
$3335 - 5087	0.2019	0.6436	0.5704	0.0765	0.0
$5088+	0.0516	0.3564	0.0623	0.0	0.0
Bronchitis and Asthma, Age 0-17 (DRG98)					
≤ $729	0.0493	0.0	0.0439	0.0	0.1822
$ 730 - 1101	0.2069	0.0	0.0	0.0929	0.6911
$1102 - 1994	0.5074	0.0	0.3472	0.8538	0.1267
$1195 - 3369	0.1872	0.5712	0.6089	0.0533	0.0
$3370+	0.0493	0.4288	0.0	0.0	0.0
Circulatory Disorders with AMI with & without C.V. Complication, Discharged Alive (DRG112)					
≤ $2848	0.0502	0.0	0.0	0.0	0.1849
$2849 - 4076	0.2009	0.0	0.0	0.0	0.7397
$4077 - 7263	0.4977	0.0	0.2417	1.0000	0.0753
$7264 - 11,008	0.2009	0.5941	0.7583	0.0	0.0
$11,009+	0.0502	0.4059	0.0	0.0	0.0
Heart Failure and Shock (DRG127)					
≤ $1926	0.0498	0.0	0.0	0.0	0.1672
$1927 - 3156	0.1991	0.0	0.0	0.0	0.6686
$3157 - 6645	0.5023	0.1702	0.2586	1.0000	0.1642
$6646 - 10,796	0.1991	0.4124	0.7414	0.0	0.0
$10,797+	0.0498	0.4174	0.0	0.0	0.0
Angina Pectoris (DRG140)					
≤ $1446	0.0500	0.0	0.0	0.0	0.2218
$1447 - 2029	0.2000	0.0	0.0	0.0508	0.7782
$2030 - 4023	0.5000	0.1344	0.1419	0.9492	0.0
$4024 - 5872	0.2000	0.3129	0.8581	0.0	0.0
$5873+	0.0500	0.5527	0.0	0.0	0.0
Esophagitis, Gastroent., and Misc. Digestive Disease Age > 69 and/or DX2 (DRG182)					
≤ $1049	0.0493	0.0	0.0	0.0	0.2000
$1050 - 1849	0.1973	0.0	0.0	0.0	0.8000
$1850 - 3781	0.5067	0.0	0.3842	0.9656	0.0
$3782 - 6859	0.1973	0.5922	0.6158	0.0345	0.0
$6860+	0.0493	0.4078	0.0	0.0	0.0
Esophagitis, Gastroent., and Misc. Digestive Diseases, Age 18-60 with/without DX2 (DRG183)					
≤ $775	0.0487	0.0	0.0	0.0	0.2298
$ 776 - 1285	0.1991	0.0	0.0	0.0710	0.7702
$1286 - 2560	0.5044	0.0	0.2018	0.9290	0.0
$2561 - 4600	0.1991	0.5832	0.7982	0.0	0.0
$4601+	0.0487	0.4168	0.0	0.0	0.0
Esophagitis, Gastroent., and Misc. Digestive Disorders, Age 0-17 (DRG184)					
≤ $594	0.0502	0.0	0.0296	0.0	0.1805
$ 595 - 920	0.2055	0.0529	0.0	0.0559	0.6875
$ 921 - 1620	0.5068	0.0396	0.4245	0.8920	0.1320
$1621 - 4146	0.1872	0.5451	0.5459	0.0521	0.0
$4147+	0.0502	0.3624	0.0	0.0	0.0

TABLE 2: The $\lambda_{kj\ell}$'s for 16 "External" Hospital Attribute Variables Representing the Association of Those Variables to the 4 Profiles Based Upon the 61 Cost Measures in Table 1

	Distribution of Attributes Over All Hospitals	PROFILE $\lambda_{1J\ell}$	$\lambda_{2J\ell}$	$\lambda_{3J\ell}$	$\lambda_{4J\ell}$
	----------Marginal Frequency----------				
Total General Beds Available					
≤ 45	0.0522	0.0	0.0	0.0	0.1851
46 - 111	0.1957	0.0	0.0963	0.0272	0.5886
112 - 281	0.5000	0.4333	0.5624	0.6712	0.2264
282 - 510	0.2000	0.1725	0.3413	0.2770	0.0
511+	0.0522	0.3942	0.0	0.0246	0.0
# Newborn Bassinets/# General Beds					
0%	0.2652	0.4997	0.4785	0.1242	0.2327
0.01% - 7.91%	0.2348	0.3934	0.1401	0.3345	0.0586
7.92% - 19.30%	0.4522	0.1070	0.3814	0.5413	0.5202
19.31%+	0.0478	0.0	0.0	0.0	0.1884
General Care Cost Per Diem					
≤ $120	0.0522	0.0	0.0	0.0	0.2066
$121 - 143	0.2000	0.0046	0.0	0.1345	0.5378
$144 - 180	0.5087	0.0663	0.2625	0.8655	0.1782
$181 - 229	0.2000	0.5541	0.7375	0.0	0.0602
$230+	0.0391	0.3750	0.0	0.0	0.0172
Intensive Care Unit Cost Per Diem					
None	0.1652	0.0302	0.2547	0.0431	0.3761
≤ $260	0.0609	0.0803	0.0	0.0	0.2125
$261 - 445	0.4652	0.0	0.1355	0.7556	0.4114
$446 - 671	0.2478	0.4004	0.5740	0.2013	0.0
$672+	0.0609	0.4891	0.0357	0.0	0.0
Adjusted Medicaid Reimbursable Costs/Total Inpatient Costs					
≤ 2.70%	0.0522	0.0	0.0319	0.0639	0.0664
2.71% - 5.83%	0.2000	0.0	0.2430	0.2445	0.1684
5.84% - 11.83%	0.5087	0.1338	0.5483	0.5361	0.5833
11.84% - 26.77%	0.1913	0.6309	0.1055	0.1555	0.1389
26.78%+	0.0478	0.2354	0.0713	0.0	0.0430
Total Inpatient Costs for Nursing School/Total Inpatient Costs					
0%	0.7074	0.4929	0.6511	0.6009	1.0000
0.01% - 2.93%	0.1397	0.3567	0.1559	0.1659	0.0
2.94%+	0.1528	0.1504	0.1930	0.2332	0.0
Total Inpatient Costs for Intern-Residence Program/Total Inpatient Cost					
0%	0.5522	0.0	0.0	0.7019	0.9760
0.01% - 3.31%	0.2087	0.0450	0.4045	0.2750	0.0240
3.32% - 6.76%	0.1478	0.3655	0.4680	0.0231	0.0
6.77%+	0.0913	0.5895	0.1276	0.0	0.0
Total Inpatient Depreciation for Buildings & Fixtures/Total Inpatient Costs					
≤ 1.42%	0.0478	0.1227	0.0805	0.0130	0.0550
1.43% - 2.55%	0.1957	0.2318	0.1936	0.1787	0.2138
2.56% - 6.97%	0.5043	0.1960	0.4336	0.6055	0.5018
6.98% - 12.84%	0.2000	0.4434	0.1908	0.1935	0.1184
12.85%+	0.0522	0.0061	0.1015	0.0093	0.1110

TABLE 3: The $\lambda_{kj\ell}$'s for 16 Hospital Characteristics as "Internal" Variables from the Second GOM Analysis of 230 Pennsylvania Hospitals

	Distribution Of Hospital Attributes Over All Hospitals	PROFILES			
		$\lambda_{1J\ell}$	$\lambda_{2J\ell}$	$\lambda_{3J\ell}$	$\lambda_{4J\ell}$
Total General Beds Available					
≤ 45	0.0522	0.0	0.0	0.0	0.2105
46 - 111	0.1957	0.0	0.0	0.0	0.7894
112 - 280	0.5000	0.4117	0.8963	0.6943	0.0
281 - 471	0.2000	0.3390	0.1037	0.3057	0.0
511+	0.0522	0.2493	0.0	0.0	0.0001
# Newborn Bassinets/# General Beds					
0%	0.2652	0.4558	0.3341	0.0785	0.3836
0.01% - 7.91%	0.2348	0.3782	0.0	0.3698	0.0
7.92% - 19.30%	0.4522	0.1660	0.6659	0.5518	0.3564
19.31%+	0.0478	0.0	0.0	0.0	0.2600
General Care Cost Per Diem					
≤ $120	0.0522	0.0	0.0	0.0	0.2427
$121 - 143	0.2000	0.0	0.1478	0.2037	0.4684
$144 - 180	0.5087	0.0	0.8522	0.7963	0.2889
$181 - 229	0.2000	0.8364	0.0	0.0	0.0
$230+	0.0391	0.1636	0.0	0.0	0.0
Intensive Care Unit Cost Per Diem					
None	0.1652	0.1735	0.1368	0.0	0.4325
≤ $260	0.0609	0.0	0.0	0.0	0.2756
$261 - 445	0.4652	0.0	0.6486	0.8017	0.2918
$446 - 671	0.2478	0.5729	0.2147	0.1983	0.0
$672+	0.0609	0.2535	0.0	0.0	0.0
Adjusted Medicaid Reimbursable Costs/Total Inpatient Costs					
≤ 2.70%	0.0522	0.0	0.2069	0.0	0.0
2.71% - 5.83%	0.2000	0.0	0.7931	0.0	0.0
5.84% - 11.83%	0.5087	0.0	0.0	1.0000	0.4413
11.84% - 26.77%	0.1913	0.6789	0.0	0.0	0.5587
26.78%+	0.0478	0.3211	0.0	0.0	0.0
Total Inpatient Costs for Nursing School/Total Inpatient Costs					
0%	0.7074	0.3346	1.0000	0.5557	1.0000
0.01% - 2.93%	0.1397	0.2786	0.0	0.2398	0.0
2.94%+	0.1528	0.3868	0.0	0.2045	0.0
Total Inpatient Costs for Intern-Residence Program/Total Inpatient Cost					
0%	0.5522	0.0	0.8028	0.5774	1.0000
0.01% - 3.31%	0.2087	0.1787	0.1972	0.4226	0.0
3.32% - 6.76%	0.1478	0.5077	0.0	0.0	0.0
6.77%+	0.0913	0.3136	0.0	0.0	0.0
Total Inpatient Depreciation for Buildings & Fixtures/Total Inpatient Costs					
≤ 1.42%	0.0478	0.0819	0.0	0.0779	0.0
1.43% - 2.55%	0.1957	0.2736	0.1434	0.1755	0.1990
2.56% - 6.97%	0.5043	0.2658	0.5648	0.5172	0.6994
6.98% - 12.84%	0.2000	0.3379	0.2241	0.2041	0.0
12.85%+	0.0522	0.0409	0.0677	0.0254	0.1016

TABLE 2 (continued)

Total Inpatient Depreciation for Major Equipment/Total Inpatient Costs					
≤ 0.96%	0.1348	0.1568	0.2177	0.1482	0.0421
0.97% - 3.00%	0.5609	0.3673	0.6372	0.5041	0.7035
3.01% - 4.03%	0.2043	0.2868	0.0	0.2990	0.1378
4.04%+	0.1000	0.1890	0.1452	0.0487	0.1167
[(Total General Days-Newborn Days)/(Total General Beds Available)]/365					
≤51.95%	0.0522	0.0	0.0	0.0	0.2203
51.96% - 70.11%	0.1957	0.0511	0.1929	0.0575	0.5369
70.12% - 84.51%	0.5043	0.5217	0.3877	0.6793	0.2428
84.52% - 90.69%	0.1957	0.4086	0.3388	0.1884	0.0
90.70%+	0.0522	0.0186	0.0807	0.0749	0.0
Medicaid Actual General Days/Total General Days					
≤ 1.66%	0.0522	0.0	0.0	0.0416	0.1280
1.67% - 5.60%	0.2000	0.0	0.2639	0.2116	0.2007
5.61% - 11.83%	0.5087	0.0463	0.5525	0.5883	0.4977
11.84% - 29.11%	0.1913	0.6851	0.1187	0.1584	0.1323
29.12%+	0.0478	0.2685	0.0649	0.0	0.0413
Medicaid Actual Special Days/Total Special Days					
≤ 1.83%	0.0514	0.0	0.0548	0.0864	0.0
1.84% - 3.85%	0.2009	0.0	0.0222	0.2369	0.3800
3.86% - 10.04%	0.5093	0.1386	0.5643	0.6104	0.4185
10.05% - 19.85%	0.1495	0.4859	0.2523	0.0663	0.0756
19.86%+	0.0888	0.3755	0.1063	0.0	0.1259
Total Population for Hospital's Resident County					
≤ 92,000	0.1982	0.0	0.0	0.0979	0.6296
92,001 - 232,000	0.2379	0.0	0.0716	0.3604	0.2457
232,001 - 644,000	0.2907	0.0	0.2869	0.4581	0.1246
644,001+	0.2731	1.0000	0.6415	0.0836	0.0
Total Actual Special Days/(Total Actual General Days + Special Days)					
0%	0.0696	0.0	0.0628	0.0	0.2405
0.01% - 4.11%	0.1826	0.0996	0.1267	0.2407	0.1505
4.12% - 7.13%	0.5087	0.3760	0.5142	0.6237	0.3400
7.14% - 11.96%	0.2000	0.3072	0.2586	0.1356	0.2316
11.97%+	0.0391	0.2172	0.0377	0.0	0.0375
Total Inpatient Costs/Total General Beds Available					
0 - 53,908	0.0522	0.0	0.0	0.0	0.2182
53,909 - 79,704	0.2000	0.0	0.0525	0.0584	0.6796
79,705 - 160,000	0.5087	0.1377	0.3067	0.8901	0.1022
160,001 - 180,000	0.2000	0.5079	0.6193	0.0515	0.0
180,001+	0.0391	0.3544	0.0215	0.0	0.0
Case-Mix Index					
0 - 0.7873	0.0522	0.0	0.0723	0.0	0.1480
0.7874 - 0.8584	0.2000	0.0	0.0794	0.0931	0.5636
0.8585 - 0.9708	0.5087	0.4449	0.5205	0.7086	0.1902
0.9709 - 1.0626	0.1957	0.3317	0.2372	0.1983	0.0981
1.0627+	0.0435	0.2234	0.0905	0.0	0.0

TABLE 3 (continued)

Total Inpatient Depreciation for Major Equipment/Total Inpatient Costs					
≤ 0.96%	0.1348	0.2845	0.1418	0.0284	0.1707
0.97% - 3.00%	0.5609	0.3889	0.4930	0.6073	0.7333
3.01% - 4.03%	0.2043	0.1204	0.1863	0.3642	0.0
4.04%+	0.1000	0.2062	0.1789	0.0	0.0960
[(Total General Days-Newborn Days)/(Total General Beds Available)]/365					
≤ 51.95%	0.0522	0.0	0.0	0.0	0.2105
51.96% - 70.11%	0.1957	0.0	0.0	0.0	0.7895
70.12% - 84.51%	0.5043	0.5900	0.3253	1.0000	0.0
84.52% - 90.69%	0.1957	0.4100	0.4656	0.0	0.0
90.70%+	0.0522	0.0	0.2091	0.0	0.0
Medicaid Actual General Days/Total General Days					
≤ 1.66%	0.0522	0.0	0.1084	0.0	0.1681
1.67% - 5.60%	0.2000	0.0	0.8916	0.0	0.0
5.61% - 11.83%	0.5087	0.0	0.0	1.0000	0.3232
11.84% - 29.11%	0.1913	0.6910	0.0	0.0	0.5087
29.12%+	0.0478	0.3090	0.0	0.0	0.0
Medicaid Actual Special Days/Total Special Days					
≤ 1.83%	0.0514	0.0	0.2037	0.0	0.0
1.84% - 3.85%	0.2009	0.0	0.7963	0.0	0.0
3.86% - 10.04%	0.5093	0.0	0.0	1.0000	0.3226
10.05% - 19.85%	0.1495	0.6814	0.0	0.0	0.3159
19.86%+	0.0888	0.3186	0.0	0.0	0.3615
Total Population for Hospital's Resident County					
≤ 92,000	0.1982	0.0	0.0	0.0	0.8332
92,001 - 232,000	0.2379	0.0	0.3423	0.4365	0.1668
232,001 - 644,000	0.2907	0.0045	0.6577	0.5635	0.0
644,001+	0.2731	0.9955	0.0	0.0	0.0
Total Actual Special Days/(Total Actual General Days + Special Days)					
0%	0.0696	0.0	0.0	0.0	0.4150
0.01% - 4.11%	0.1826	0.0	0.2012	0.2053	0.2964
4.12% - 7.13%	0.5087	0.4089	0.5881	0.7073	0.0
7.14% - 11.96%	0.2000	0.4263	0.2107	0.0875	0.2325
11.97%+	0.0391	0.1648	0.0	0.0	0.0560
Total Inpatient Costs/Total General Beds Available					
0 - 53,908	0.0522	0.0	0.0	0.0	0.2069
53,909 - 79,704	0.2000	0.0	0.0	0.0	0.7931
79,705 - 160,000	0.5087	0.0	1.0000	1.0000	0.0
160,001 - 180,000	0.2000	0.8364	0.0	0.0	0.0
180,001+	0.0391	0.1636	0.0	0.0	0.0
Case-Mix Index					
0 - 0.7873	0.0522	0.0	0.0	0.0	0.2171
0.7874 - 0.8584	0.2000	0.0	0.0	0.2026	0.5376
0.8585 - 0.9708	0.5087	0.4761	0.3635	0.7974	0.2452
0.9709 - 1.0626	0.1957	0.3449	0.5965	0.0	0.0
1.0627+	0.0435	0.1790	0.0400	0.0	0.0

TABLE 4: Distribution of Coefficients (g_{ik}'s) Representing Each of the 230 Pennsylvania Hospital's Relation to Each of the Four Profiles Derived from the Analysis of the 61 Cost Measures (Analysis 1)

	PROFILES			
Range of g_{ik}	g_{i1}	g_{i2}	g_{i3}	g_{i4}
0.0 - 0.025	156	96	39	90
0.026 - 0.250	43	68	25	53
0.251 - 0.500	13	30	55	38
0.501 - 0.750	4	25	67	28
0.751 - 0.975	3	7	42	14
0.976 - 1.000	11	4	2	7
Total	230	230	230	230

TABLE 5

GOM GROUP	HOSPITAL CHARACTERISTICS	COST STRUCTURE
1	$3019	$2854
2	$1613	$2299
3	$1477	$1637
4	$1119	$1034
	R^2=49%	R^2=58%

TABLE 6: Impact On Operating Costs of Adjusting Medicaid Reimbursement Using 7 Groups Defined by Hospital Association of Pennsylvania

		Percentage Increase In Reimbursement				NO EFFECT		Percentage Decline In Reimbursement			
		10% OR MORE		2-10%		-2% TO +2%		2-10%		10% OR MORE	
HAP	(N)	N	%	N	%	N	%	N	%	N	%
1	30	11	37	6	20	3	10	5	17	5	17
2	30	9	30	3	10	2	7	10	33	6	20
3	35	11	31	4	11	2	6	7	20	11	31
4	36	10	28	9	25	2	6	6	17	9	25
5	28	8	29	5	18	2	7	5	18	8	29
6	28	10	36	5	18	1	4	5	18	7	25
7	43	15	35	6	14	4	9	10	23	8	19
TOT	230	74	32	38	17	16	7	48	21	54	23

TABLE 7: Impact on Operating Costs of Adjusting Medicaid Reimbursement Using 4 Groups Defined on the Basis of the GOM Analysis of 16 Hospital Characteristic (Linear Equation Prices)

		Percentage Increase In Reimbursement				NO EFFECT		Percentage Decline In Reimbursement			
		10% OR MORE		2-10%		-2% TO +2%		2-10%		10% OR MORE	
GNP	N	N	%	N	%	N	%	N	%	N	%
1	30	8	27	9	30	3	10	6	20	4	13
2	30	13	43	6	20	3	10	5	17	3	10
3	35	15	43	1	3	3	9	7	20	9	26
4	36	6	17	10	28	4	11	10	28	6	17
5	28	8	29	3	11	3	11	4	14	10	36
6	28	11	39	6	21	1	4	4	14	6	21
7	43	27	63	9	21	4	9	3	7	0	0
TOT N=230		88	38	44	19	21	9	39	17	38	17

TABLE 8: Impact on Operating Costs of Adjusting Medicaid Reimbursement Using 4 Groups Based on GOM Analysis of 61 Cost Structure Variables (Log-Linear Prices)

		Percentage Increase In Reimbursement				No Effect		Percentage Decline In Reimbursement			
		10% OR MORE		2-10%		-2% TO +2%		2-10%		10% OR MORE	
GRP	CNT	N	%	N	%	N	%	N	%	N	%
1	30	7	23	9	30	2	7	6	20	6	20
2	30	16	53	3	10	2	7	5	17	4	13
3	35	19	54	4	11	4	11	5	14	3	9
4	36	11	31	7	19	3	8	8	22	7	19
5	28	10	36	5	18	0	0	5	18	8	29
6	28	12	43	2	7	6	21	5	18	3	11
7	43	23	53	8	19	8	19	3	7	1	2
TOT	230	98	43	38	17	25	11	37	16	32	11

APPENDIX C

Date June 3D, 1983 — Workplan for Development of State DRG Syatem: An Example from Pennsylvania — Pega 1 of 9

SCHEDULE DATE	ACTIVITY	COMPLETED DATE	RESPONSIBILITIES
6/17/83	Draft raport and work plan to Deputy Sacretary		CCP
6/21/83	Draft raport and work plan raviawad with daputy sacretary and buraau directors		CCP
6/3D/83	Raport and work plan to daputy secretary		CCP
7/14/B3	OMA epprova work plan		Deputy Sacretary
7/15/B3	Prapara training packaga on currant coat system and DRG plan		8PR
7/15/83	Action mamo on RFP for DRG contract praparad		BPPD
7/1B/83	Circuleta RFP for DRG contract for commants		BPPD
7/2D/83	Commanta on RFP for DRG contract to BPPD		BRM, BPR, BMAO
7/2D/83	Prasant DRG plan to OMA & OIS ataff		BPPD, BPR
7/22/B3	Praaent DRG plan to sacratary, Executiva daputy sacratary & DPW lagal		BPPD, BPR
7/22/83	EDS approve ection mamo on RFP for DRG contract		EDS
7/25/83	DMA approva RFP for DRG contract		Daputy Sacratary
7/26/83	Action mamo and RFP for DRG contract to procurament		BPPD
7/26/83	Diatributa RFP for DRG contract to DPW adm. offica (offica sarvicas & daputy secretary administration)		BPPD
7/27/B3	RFP for DRG contract to DGS (on diaplay 15 daya)		Procurement
7/27/83	Notica of RFP for DRG contract to LRB		Procurement
7/29/83	Maating with OMA bureaus and DPW adm. staff on RFP for DRG contract		BPPD

SCHEDULE DATE	ACTIVITY	COMPLETED DATE	RESPONSIBILITIES
B/D1/B3	Amendments to public welfare code for DRG'e prepered		BPPD
B/D6/B3	Notice of RFP for DRG contrect published		LRB
8/08/83	DMA approve emendments to public welfare code		Deputy Secretary
B/11/83	RFP for DRG contrect to HCFA for approval		BPPD
B/11/B3	Rewrite for RFP for DRG contrect completed		BPPD
B/11/B3	RFP for DRG contrect mailed to prospective bidders		Procuramant
B/25/B3	Bidder conference on EFP for DRG contrect		BPPD
8/25/B3	Present DRG plen to MAAC, Hospital Subcommittee, HAP		BPPD, BPR
B/3D/B3	Dacida DRG issue 4a, 4b, 4c (cost raports)		BPPD
B/3D/B3	Obtain cost reports to be used for aatimating DRG's		BRM
8/3D/B3	Present DRG plen to DIM, office of fiscel menagament, comptroller, auditor general		BPPD, BPR
9/12/B3	Receive bids on RFP for DRG contrect		Procurement
9/15/B3	Distribute proposed DRG ragulationa to DMA staff		BPPD
9/23/83	RDP for DRG contrect bid avaluation procass complete		8PPD
9/27/B3	DMA approve awerd to DRG contractor		Daputy Secretary
9/29/83	Comments on proposad DRG ragulations to BPPD		BPPD
9/3D/83	DPW approve awerd to DRG contractor		EDS
9/3D/83	Award mede to DRG contractor		Secretary

SCHEDULE DATE	ACTIVITY	COMPLETED DATE	RESPONSIBILITIES
9/30/83	Present DRG plan to legislative staff and/or members (including IRRC if appropriate)		BPPD, BPR
9/30/83	Present DRG plan to attorney general, governor's planning office, office of the budget, task force, dept. of health, insurance department		BPPD, BPR
10/13/83	DRG contract negotiated		BPPD
10/14/83	Vendor sign DRG contract		BPPD
10/14/83	Determine objectives for DRG issues 21 and 22 (U.R.)		BUR
10/17/83	Deputy secretary sign DRG contract		Deputy Secretary
10/18/83	Legal sign DRG contract		DLC
10/18/83	Contract to HCFA for approval		BPPD
10/20/83	Proposed DRG regulations to deputy secretary		BPPD
10/21/83	Review of objectives for DRG issues 21 and 22 (U.R.)		BPR, BPPD, BRM, BMAD
10/21/83	Attorney general sign DRG contract		BPPD
10/24/83	Compliance review DRG contract		BPPD
10/26/83	Pre-audit (comptroller) review DRG contract		BPPD
10/28/83	DPW sign DRG contract		Secretary
10/28/83	Approve objectives for DRG issues 21 and 22 (U.R.)		Deputy Secretary
10/31/83	Comptroller sign DRG contract		Comptroller
11/01/83	DRG contract in place		BPPD
11/02/83	Deputy secretary approves proposed DRG regulations		Deputy Secretary

SCHEDULE DATE	ACTIVITY	COMPLETED DATE	RESPONSIBILITIES
11/04/83	Present proposed regulations to OIS staff, secretary and executive deputy secretary		BPPD
11/04/83	Present proposed regulations to OIM, office of fiscal mgmt. comptroller, auditor general		BPPD
11/04/83	Present proposed regulations to DPW legal, attorney general, governor's planning office, office of the budget, task force, department of health, insurance department		BPPD
11/09/83	Legal approve proposed ORG regulations		OLC
11/09/83	Office of fiscal Management approve proposed DRG regulations		PFM
11/16/83	DPW approve proposed ORG regulations		EDS
11/17/83	Present proposed regulations to MAAC, hospital subcommittee, HAP		BPPD
11/21/83	Prepare DPSR's for CHR, claims, MARS, SURS, and cost settlement reports for DRG changes		BMAD
11/21/83	Determine reference file changes for ORG's		BMAO
11/21/83	Determine resolution procedures for DRG's		BPR
11/21/83	Determine methods for ORG issues 21 and 22 (U.R.)		BUR
11/29/83	Approve OPSR's for provider file DRG changes		BMAO, BBPD, BRM, BUR
11/29/83	Approve DPSR's for ORG changes		BMAO, BPPD, BRM, BUR
12/01/83	Approve methods for ORG issues 21 ned 22 (U.R.)		Deputy Secretary
12/02/83	Submit OPSR's for provider file ORG changes to BMAO		BPR
12/02/83	Determine enrollment procedures for ORG changes		BPR

SCHEDULE DATE	ACTIVITY	COMPLETED DATE	RESPONSIBILITIES
12/06/83	Submit DPSR's for ORG chenges to OIS		BMAO
12/14/83	Tesk force epprove proposed ORG reguletions		BPPD
12/30/83	Present proposed reguletions to legisletive steff end/or members (including IRRC is eppropriete)		BPPD
01/09/84	Submit enelysis peckege for ORG chenges		OIS
01/13/84	Attorney generel epproves proposed ORG reguletions		OLC
01/13/84	Proposed ORG reguletions to LRB, IRRC, end stending committees		OPPE
01/13/84	Proposed ORG reguletions to HCFA		BPPD
01/23/84	Approve enelysis peckege for ORG chenges		BMAO
01/27/84	Oevelop hospitel provider egreements to include DRG peyment		BPPO
01/28/84	Proposed ORG reguletions published		BPPD
01/30/84	Oevelop procedures for ORG issues 21 end 22 (U.R.)		BUR
02/02/84	Approvel of procedures for DRG issues 21 end 22 (U.R.)		Oeputy Secretery
02/03/84	Objectives end procedures for DRG issues 21 end 22 (U.R.) BPPO to include in reguletions		BUR
02/03/84	OMA epprove hospitel provider egreements		Oeputy Secretery
02/10/84	EOS epprove hospitel provider egreements		EOS
02/13/84	Proposed ORG reguletions epproved by IRRC		OPPE
02/24/84	Attorney generel epprove hospitel provider egreements		OLC
02/28/84	Comments received on proposed ORG reguletions		BPPD

SCHEDULE DATE	ACTIVITY	COMPLETED DATE	RESPONSIBILITIES
D3/D1/84	Decide DRG issue 4d (DRG pricing)		BPPD
D3/02/84	Mail new hospitel agreements		BPR
D3/15/84	Resolve DRG iseue 6 (cleseificetion)		BPPD
C3/15/84	Resolve DRG issue 8 (children's hospitels)		BPPD
D3/15/84	Resolve DRG iseue 9 (teaching hospitels)		BPPD
C3/15/84	Resolve DRG iseue 1D (eree differencee)		BPPD
D3/15/84	Resolve DRG iseue 11 (capitel costs)		BPPD
D3/15/84	Resolve DRG issue 12 (capitel coets)		BPPD
D3/15/84	Resolve DRG issue 13 (capitel coets)		BPPD
D3/15/84	Resolve DRG issue 14 (outliers)		BPPD
03/15/84	Resolve DRG issue 15 (other outliers)		BPPD
C3/15/84	Resolve DRG issue 16 (SPU)		BPPD
C3/15/84	Resolve DRG iseue 17 (billing form)		BPPD
C3/15/84	Resolve DRG issue 18 (out-of-stete)		BPPD
C3/15/84	Resolve DRG issue 19 (recelibretion)		BPPD
C3/15/84	Resolve DRG iseue 20 (updeting)		BPPD
C3/15/84	Resolve DRG issue 23 (transfers)		BPPD
C3/15/84	Resolve DRG issue 24 (unbundling)		BPPD
C3/15/84	Resolve DRG issue 25 (phese-In)		BPPD
D3/15/84	Resolve DRG issue 27 (disposition deys)		BPPD
03/15/84	Distribute finel DRG regulations to DMA eteff		BPPD
C3/22/84	Comments to BPPD on finel DRG regulations		BPPD

SCHEOULE DATE	ACTIVITY	COMPLETED DATE	RESPONSIBILITIES
03/22/84	Preaent finel reguletione to MAAC, Hoepitel subcommittee, HAP		BPPD
03/29/84	Finel DRG regulations developed		BPPD
04/02/84	Oeputy aecratery epprove finel DRG regulatione		Deputy Secretary
04/02/84	Stata plan amendment on DRG's preparad		BPPD
04/04/84	Praaent finel reguletione to OIS eteff, aecretery, executiva deputy secretery, end DPW legel		BPPD
04/04/84	Present finel regulationa to OIM, office of fiecel mgmt., comptrollar, euditor genaral		BPPD
04/04/84	OMA approve stete plan emendment		Deputy Secretary
04/06/84	Oraft new hospitel hendbooke		BPR
04/09/84	Legel approvas final ORG regulationa		OLC
04/09/84	Offica of fiscel managamant approves final DRG reguletione		OFM
04/09/84	Legal epprovee atete plan amendment on DRG'e		OLC
04/13/84	Reviaw end comment on hospitel hendbooke		BPR, BPPD, BRM, BMAC
04/13/84	OPW approvea final DRG reguletions		EDS
04/16/84	OWP epprovee atete plen amendment on DRG's		EDS
04/16/84	Steta plen emendment on ORG'a eubmitted to HCFA		BPPD
04/16/84	Dreft bulletins for ORG chenges		BPPD
04/16/84	Revisa hoepital hendbooke beeed on commente		BPR
04/20/84	Hoepitel handbooks epproved		Deputy Secretery

SCHEDULE DATE	ACTIVITY	COMPLETED DATE	RESPONSIBILITIES
04/20/84	Present final regulations to attorney general, governor's planning office, office of the budget, task force, department of health, insurance department		BPPD
04/20/84	Present final regulations to legislative staff nad/or members (including IRRC if appropriate)		BPPD
04/20/84	Submit test for DRG changes		OIS
04/20/84	Prepare training package		BPR
04/27/84	Task force approves final DRG regulations		BPPO
05/01/84	Hospital handbooks to printer		BPR
05/01/84	New hospital provider agreements signed, affective July 1, 1984		BPR
05/01/84	Bulletins for DRG changes reviewed and completed		BPR
05/04/84	Approve test for DRG changes		DMAC
05/04/84	DMA approves bullatins for DRG changes		Deputy Secretary
05/11/84	Legal approves bulletins for DRG changes		OLC
05/14/84	Bullatins on DRG changes to printer		BPR
05/14/84	Attorney general approves final DRG regulations		DLC
05/14/84	Final DRG regulations to LRB		OPPE
05/25/84	Bullatins and hospital handbooks mailed		BPR
05/26/84	Final DRG regulations published		BPPO
06/14/84	Provider training on DRG's completed		BPR
06/15/84	Enrollment changes for DRG's completed, effective July 1, 1984		BPR

SCHEDULE DATE	ACTIVITY	COMPLETED DATE	RESPONSIBILITIES
06/22/84	Implement DPSR's for DRG changes effective July 1, 1984		OIS
06/29/84	Implement reference file changes for DRG's		BMAC
06/29/84	Implement resolution procedure changes for DRG's		BMAD
07/01/84	DRG's implemented		DMA

GLOSSARY

Budget Neutrality - The requirement that Medicaid payment for total inpatient operating costs to hospitals under the DRG prospective payment system during one or more subsequent fiscal years should be neither greater nor less than the estimate of what would have been paid under the reimbursement system in place prior to enactment of DRG prospective payment.

Case Mix - The composition of a health program's patients are classified by diagnosis or by some other measure.

Case Mix Index - The average relative value in a hospital.

Case Type Categories - A classification system for inpatient cases. Usually a set of case type categories groups together patients who might be expected to require similar revenues for treatment. DRGs are an example of this type of case type category, i.e., categories that are homogeneous with respect to treatment cost. Case type categories can be designed which are homogeneous with respect to the probability of death, need for certain tests, etc., depending on their intended use.

Charge - The amount of money asked for by a seller in return for a product or a service. A hospital's charge is equivalent to its list or asking price for a service. Medicaid, and some other payers, however, do not pay charges for inpatient hospital services.

Children's Hospital - A hospital whose inpatients are predominantly under eighteen years of age and which has a Medicare provider agreement meeting applicable requirements.

Claim - A request to a third-party payer (e.g., private insurer, government payment program, employer payment program) by a person covered by the third-party program or an assignee (usually a provider of service) for payment of benefits covered by the third party.

Classification - The act or process of systematically arranging in groups or categories according to established criteria. Under Prospective Payment System, patients are classified into disease categories using the ICD-9-CM classification system and then further grouped into diagnosis-related groups.

Comorbidity - A pre-existing condition that will, because of its presence with a specific principal diagnosis, increase length of stay by at least one day in approximately 75 percent of cases.

Complication - A condition that arises during the hospital stay that prolongs length of stay by at least one day in approximately 75 percent of cases.

Controlled Rate of Increase - Prices computed so that program spending increases or decreases at a predetermined rate (see Price Level).

Cost - The cost to the buyer is the amount of money paid by the buyer to acquire a good or service. The cost to the seller is the amount of money paid by the seller for the inputs used to produce a service or good.

Cost-Based Reimbursement - A method of paying for services based on the costs incurred by a provider to furnish those services, often associated with a detailed, rigid, and prescribed set of rules governing payment.

Diagnosis-Related Groups (DRGs) - A system for determining case-mix. Originally developed by researchers at Yale University, the DRG system index classifies patients into groups based on the international classification of diseases, the presence or absence of significant comorbidities or complications, and other relevant criteria. The DRG classification attempts to categorize patients into clinically coherent and homogeneous

groups with respect to resource use. PPS currently uses 468 mutually exclusive DRGs to classify patients and determine case mix. The first 467 DRGs represent categories in which the principal procedure is consistent with the principal diagnosis assigned to the patient. DRG 468 represents cases in which the principal procedure is unrelated to the valid principal diagnosis. DRG codes 469 and 470 may be assigned if the fiscal intermediary finds certain errors in bills submitted by hospitals. When this occurs, the bills are returned to the hospital for correction. DRGs 469 and 470 are not used as a basis of payment.

DRG Weight - A number which is intended to reflect the relative resource consumption associated with each DRG. That is, DRG weight reflects the average cost across all hospitals of treating cases classified in that DRG compared to the average cost for all DRGs. For example, under the fiscal 1985 Medicare program, the DRG weights range from .1842 for DRG 382 (false labor) to 6.8631 for DRG 457 (extensive burns). Because Medicare does not cover heart transplants, DRG 103 has not been assigned a weight.

Discharge - A hospital inpatient is discharged when: 1) the patient is formally released from the hospital (except when transferred to another hospital under the prospective payment

system (see definition of transfer); 2) the patient dies in the hospital; or 3) the patient is transferred to a hospital or until that is excluded from the prospective payment system.

Discretionary Adjustment Factor (DAF) - The single quantitative adjustment which is added to or subtracted from the hospital market basket measure of inflation to arrive at the update factor.

Exempt Hospitals and Units - Generally speaking, an exempt hospitals or units are those paid under some method other than DRGs. Childrens', long-term care (average length of stay over twenty-five days), rehabilitation, and psychiatric hospitals are specifically excluded from Medicare's and some states' systems the prospective payment system. Under Medicare, rehabilitation or psychiatric "distinct part" subunits of acute care hospitals are exempted if they meet certain criteria as specified by the secretary of health and human services. Hospitals located in U.S. Territories (e.g., Puerto Rico), alcohol or drug abuse treatment units of acute hospitals (until October 1, 1985), federal hospitals, and Christian Science Sanatoria are also exempted. Cancer treatment and research facilities may receive an exemption if they meet criteria established by the secretary. Under Medicare, exempt hospitals remain under cost-based reimbursement, subject to the TEFRA target rate of increase limits.

Expenditure - The amount of money paid for a good or service during a specified time period. The actual service or good could have been acquired or used prior, during or subsequent to the period in which the money is paid.

Grouper - A computer program used to assign discharges to the appropriate DRG using information abstracted from the in-patient bill.

Homogeneous Patient Groups - A group of patients who consume similar types and amounts of resources. This is an important criterion for developing patient classification systems. Homogeneity of groups is often tested using statistical techniques, leading to the use of the term, statistical homogeneity. Patient classifications are typically designed to be understandable to the medical community as well as statistically homogeneous.

Hospital Group - A set of hospitals with shared characteristics, e.g., teaching hospitals. For prospective payment, hospitals in a particular group receive similar payments.

Hospital Market Basket - The set of goods and services purchased by hospitals.

Hospital Market Basket (Input Price) Index - A hospital market basket index is constructed by: 1) specifying the inputs that hospitals purchase and combining inputs into components; 2) determining a weight for each component that represents its share of total hospital expenses; and 3) identifying measures of price changes for each component. The overall change in the price of the market basket is computed by multiplying each component's price change by its weight, and summing across all components. This index is used for adjusting Medicare DRG prices.

International Classification of Disease, Ninth Revision, Clinical Modification - A system for classifying diseases and procedures to facilitate collection of uniform and comparable health information. The disease classification is revised every ten years and the ICD-9 is the 9th version. This system is the basis for grouping patients into DRGs.

Long-Term Care Hospital - Those hospitals which have an average inpatient length of stay more than twenty-five days.

Major Diagnostic Category (MDC) - Within the DRG classification system, there are twenty-three MDC categories based on body system involvement and disease etiology. All DRGs fit into one of the twenty-three MDCs.

Medical Technology - The drugs, devices, and medical and surgical procedures used in medical care, and the organizational and supportive systems within which such care is provided.

Morbidity - A diseased state; often used in the context of a "morbidity rate," i.e., the rate of disease or proportion of diseased persons in a population. In common clinical usage, complications or comorbidities are referred to as morbidity.

Non-Physician Services - All services provided to inpatients by personnel other than physicians as defined by the secretary of health and human services. Non-physician services would include, for example, services of a physical therapist, or radiology technician.

Normalization - The adjustment of all DRG weights after recalibration or reweighting so that the average case weight equals a predetermined level, usually I.D.

Outliers (atypical cases) - Cases which have an extremely long length of stay (day outlier) or extraordinarily high costs (cost outlier) when compared to most discharges classified in the same DRG.

Payment - The generic term for various types of monetary compensation for services received or goods acquired. Payment can be made before or after services are received or goods are acquired.

Peer Review Organizations (PROs) - Successor organizations to Professional Standards Review Organizations (PSROs) which perform medical peer review of Medicare claims, including review of validity of hospital diagnosis and procedural information; completeness, adequacy, and quality of care; appropriateness of admission and discharge; and appropriateness of Prospective Payment System outlier cases. A PRO is composed of (or has available to it) a substantial number of medical doctors or doctors of osteopathy to carry out the review. HCFA contracts for PRO review for all Medicare patients in a specified geographic area; in the absence of a PRO, the fiscal intermediary performs these reviews.

Price - As generally used, the amount of money asked for by a seller in return for a good or service. In a Medicaid DRG system, the price for a hospital discharge is set by the buyer, the Medicaid program.

Price Level - The dollar value of the prices across all DRGs, computed such that program spending equals a given amount. This amount may be budget neutral or derived from a controlled rate of increase.

Principal Diagnosis - That condition which after study is determined to be the reason chiefly responsible for occasioning the admission of the patient to the hospital.

Principal Procedure - The principal procedure is: 1) the one most related to the principal diagnosis; or 2) the one which was perfomed for definitive treatment rather than performed for diagnostic or exploratory purposes, or was necessary to treat a complication. If only one procedure is performed it is considered the principal procedure. For prospective payment, the Grouper program will select the most expensive procedure if several procedures are listed.

Prospective Payment (Pricing) - A method of payment for health care services in which 1) full amounts or rates of payment are established in advance, and 2) providers are paid these amounts or rates regardless of the costs they actually incur. A distinction is sometimes made between payment and pricing based on whether payment is made in advance for services or the price is simply set in advance.

Psychiatric Hospital - An institution that 1) primarily engages in providing, by or under the supervision of a physician, psychiatric services for the diagnosis and treatment of mentally ill persons; 2) satisfies the statutory requirements of a "hospital"; 3) maintains clinical records on all patients such that the degree and intensity of the treatment provided can be readily discerned; 4) meets the special staff requirements for psychiatric hospitals; and 5) is accredited by the Joint Commission on Accreditation of Hospitals.

Public Utiliy Model - A budget review payment system, e.g., New Jersey. These options usually generate solvency for hospitals.

Rebasing of DRG Standardized Amounts - The redetermination of the base upon which to project the DRG standardized amounts from new or more recent data, generally cost data.

Rebundling of Hospital Payment - Payment to hospitals for inpatient services which were formerly paid to other suppliers under separate billing. For Medicaid, rebundling refers to payment to hospitals for nonphysician services to hospital inpatients which were formerly billed separately. For example, the inclusion of certain laboratory tests in DRG payment which previously were billed separately.

Recalibration - The adjustment of all DRG weights to reflect changes in relative resource use associated with all existing DRG categories (usually to reflect technical advances in the practice of Medicare) and/or the creation or elimination of DRG categories.

Reclassification - The adjustment of certain DRG categories to reflect the creation or elimination of DRG categories or movement of certain diagnostic or procedure codes from one DRG category to another. After reclassification, the resulting categories may need to be reweighted.

Relative Value -- See DRG Weight

Relative Weight -- See DRG Weight

Reweighting - The adjustment of only certain DRG weights to reflect changes in relative resource consumption. Reweighting can be done without reclassification.

Statewide Rate (Price) - A single set of DRG prices applied to all non-exempt hospitals in a state. Hospital specific prices are the other end of the price discrimination continuum with hospital group prices following in between.

Transfer - A transfer is defined as the movement of a patient: 1) from one inpatient area or unit of the hospital to another area or unit of the hospital; 2) from the care of a hosptial paid under prospective payment to the care of another such hospital; or 3) from the care of a hospital under prospective payment to the care of a hospital in an approved statewide cost control program.

Trim Point - There are two kinds of trim points. The first is cost or length of stay values that determine outlier status for payment. For example, if a case in DRG 10 which stayed more than twenty or less than two days receives special payments as a result, then the trim points for DRG 10 are two and twenty days. Commonly only high trim outliers receive special payments.

Second, in computing relative weights, aberrant cases are usually identified and eliminated from the calculation. Most commonly these cases are identified as cases outside the interval plus or minus, e.g., three standard deviations in logarithms. In this instance, the "plus and minus" numbers are the trim points. Both definitions may be used by a single prospective payment program since their purposes are different. In addition, there is no reason for the definition of aberrant cases to match the definition of outliers for payment.

Unbundling of Hospital Payment - Separate payment to non-hospital suppliers for services provided to hospital patients.

Unbundling of Hospital Inpatient Services - The provision of services on an outpatient basis which were formerly furnished to inpatients (e.g., performance of diagnostic studies prior to a patient's admission, or the provision of rehabilitation services after the patient's discharge). Alternatively, unbundling can be viewed as the provision of hospital services by lease or other administrative arrangement with other suppliers.

Uniform Hospital Discharge Data Set (UHDDS) - A data set, based on the Uniform Hospital Abstract Minimum Data Set, that gives a minimum description of a hospital episode or admission. The UHDDS includes data on the age, sex, race, and residence of the patient, length of stay, diagnosis; responsible physicians ; procedures performed; disposition of the patient; and source of payment. The UHDDS originally developed by the National Center for Health Statistics.

Updating Factor (Rate of Increased Factor) - The percentage change applied to the previous year's payment rates which takes into account the amounts necessary for the efficient and effective delivery of medically appropriate and necessary care of high quality. The update factor is to reflect changes in the prices

of goods and services purchased by hospitals, the hospital "market basket" as well as changes in hospital productivity, technological advances, quality of care, and long-term cost-effectiveness of services. More specifically, updating is the adjustment of the base year cost data for inflation. Referred to as an "updating" or "inflation" factor.

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